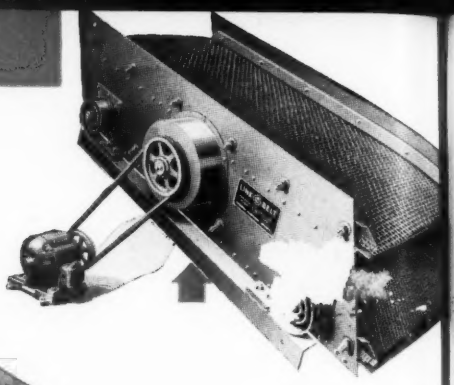
Mining CONGRESS JOURNAL

THE AMERICAN MINING CONGRESS

FEBRUARY 1948

Concentric Action Vibrating Screen



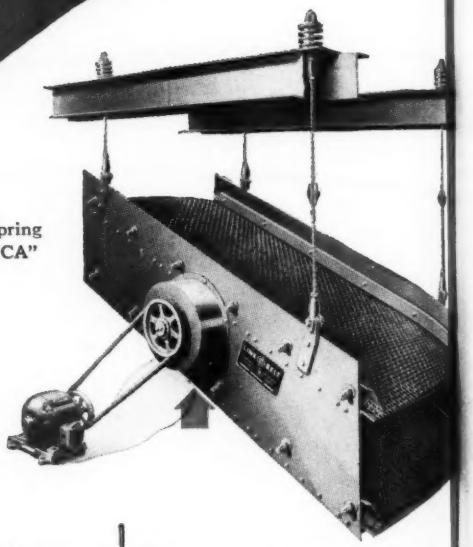
Above: Basic flo mounted, with ste support members.

Left: Floor mount adjustable slope wi sub-frame and mot support.

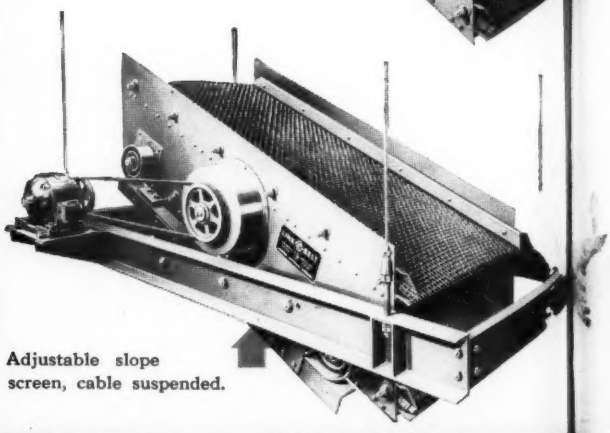
CA SCREENING COST CUTTER

The performance of the new Link-Belt Concentric Action vibrating screen in the field continues to surprise those who have seen it in operation. The "CA" unit, which imparts a concentric or circular vibrating motion to all parts of the screening surfaces, sets up new standards of efficiency and capacity as shown by: extreme smoothness in starting and stopping . . . superior performance on overloads . . . increased amplitude at high speeds permitting increased capacities . . . screen cloth tension easily controlled . . . unobstructed screening surface. The "CA" screen is easily inspected and serviced. Speed and amplitude can be changed in the field to suit screening conditions. Field adjustment of slope can be made without altering supports on all models except basic floor mounted.

The illustrations show the flexibility of mounting. For technical details write for Book No. 2154.



Cable and spring suspended "CA" screen.



Adjustable slope screen, cable suspended.

LINK-BELT COMPANY

Chicago 9, Philadelphia 40, Pittsburgh 19, Wilkes-Barre, Huntington, W. Va., Denver 2, Kansas City 6, Mo., Cleveland 13, Indianapolis 6, Detroit 4, St. Louis 1, Seattle 4, Toronto 8.

10,969

COAL PREPARATION AND HANDLING EQUIPMENT

Engineered, Built and Backed by LINK-BELT

Mining Congress Journal

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Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress

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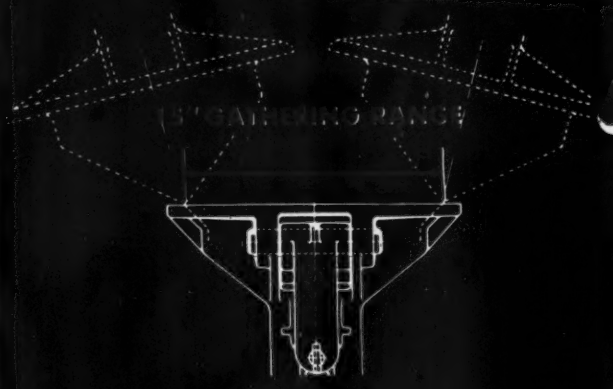
ABC

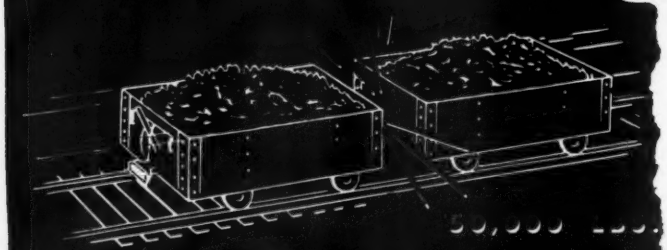
BUILT FOR



. . . ON CURVES

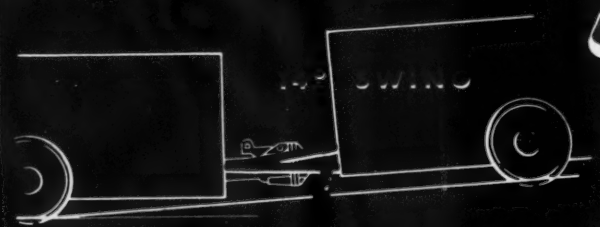
Male-and-female type coupler heads provide the O-B Automatic Coupler with 50 percent more gathering range than is found in ordinary couplers. Depending upon the car construction and its relation to the track, O-B Couplers will enable cars to operate over and automatically couple upon curves of minimum radius.

. . . UNDER HEAVY IMPACT



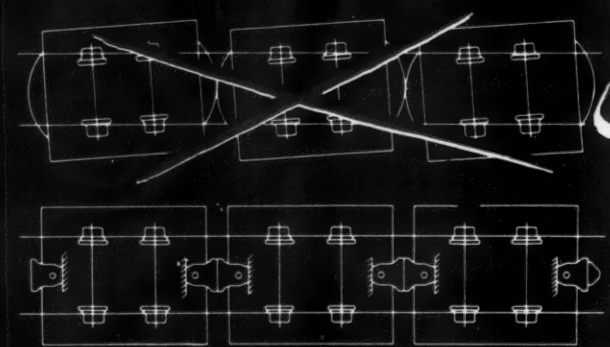
Tough, springy rubber buffing pads replace breakable steel springs in O-B's modern draft gear assembly. Completely enclosed, the rubber draft gear will absorb impact blows up to 50,000 pounds—as much as 100,000 pounds with the Form-8 design.

. . . OVER DIPS AND KNUCKLES



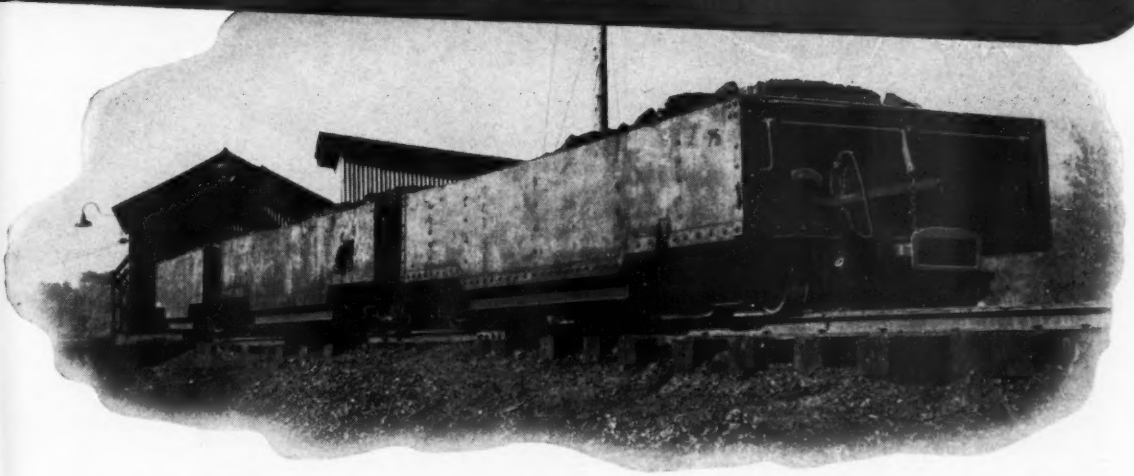
A vertical swing of 14° enables O-B Couplers to operate over sharp breaks in grade. All movement takes place in the flexible rubber draft gear—the coupler faces remain locked to each other in center-to-center position. In addition, five inches of vertical gathering range permit the couplers to join on a wide range of dips and knuckles.

. . . ON THE TRACK



Preventing zigzagging under push or buff, O-B Form-8 Couplers actually help to keep your cars on the track. An improved draft gear construction holds the cars tightly in center-to-center position counteracting the car's normal tendency to ride the rail under push or buff.

MINE WORK



Take a good look at the O-B Automatic Coupler in the picture above. It appears to be different from railroad-type couplers. It *is* different—and for good reasons, too! Railroad-type couplers were developed for railroads with their long stretches of straight track and gradual curves and grades. Mining service imposes an entirely different set of conditions. It requires a coupler which is designed specifically to meet those conditions.

Because mine curves have shorter radii and coupling on curves is frequent, O-B Couplers are provided with extra-wide gathering range. They permit cars to operate over sharp breaks in grade at dips and knuckles. Their sturdy rubber draft gear will absorb severe impact blows without damage. The O-B Form-8 Coupler exerts a stabilizing pressure to counteract a mine car's normal tendency to derail under push or buff.

If you are considering the purchase of new mine cars, you will find it profitable to investigate the O-B Automatic Coupler—the coupler that was designed specifically to meet mine operating conditions. A postcard request will bring full information.

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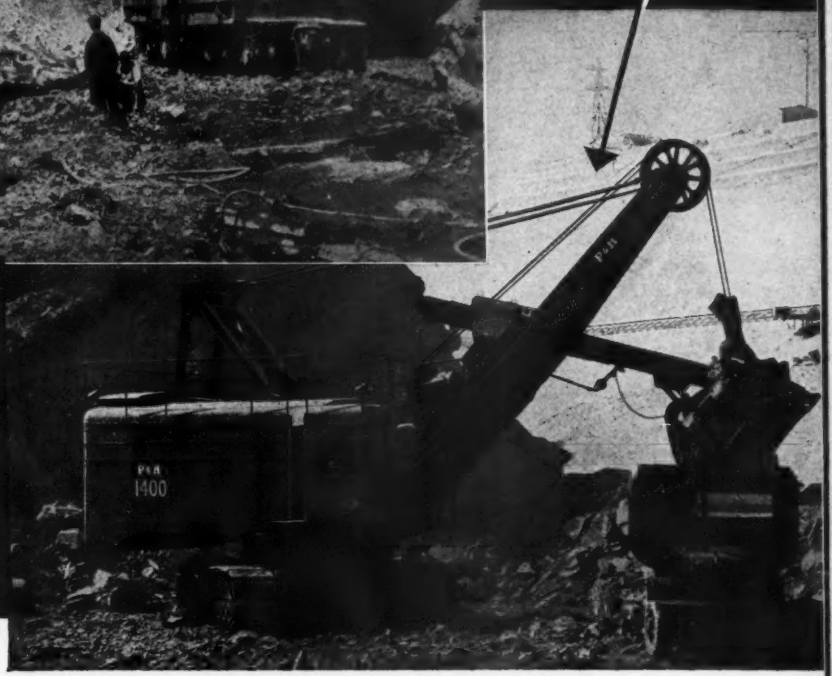

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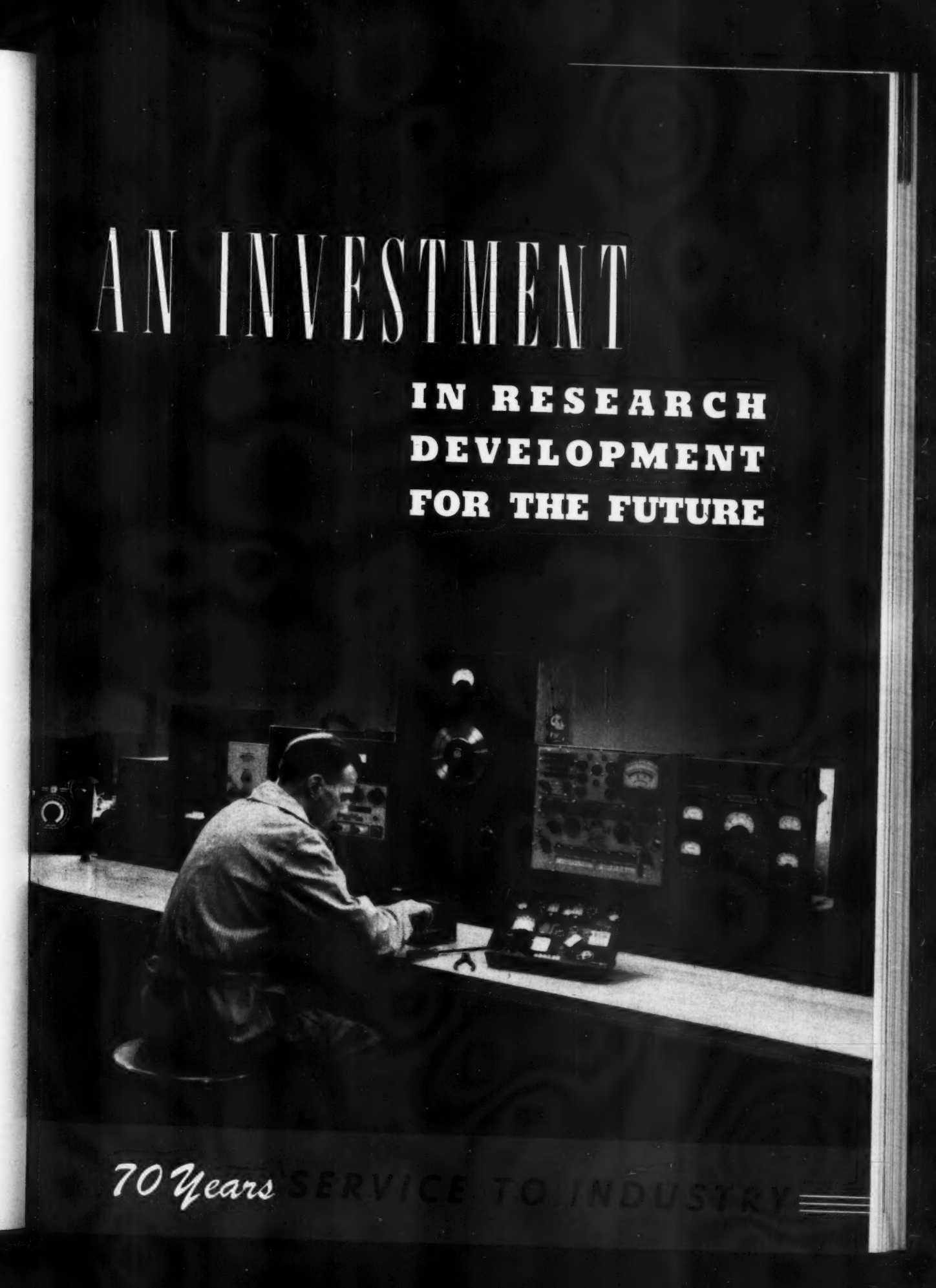
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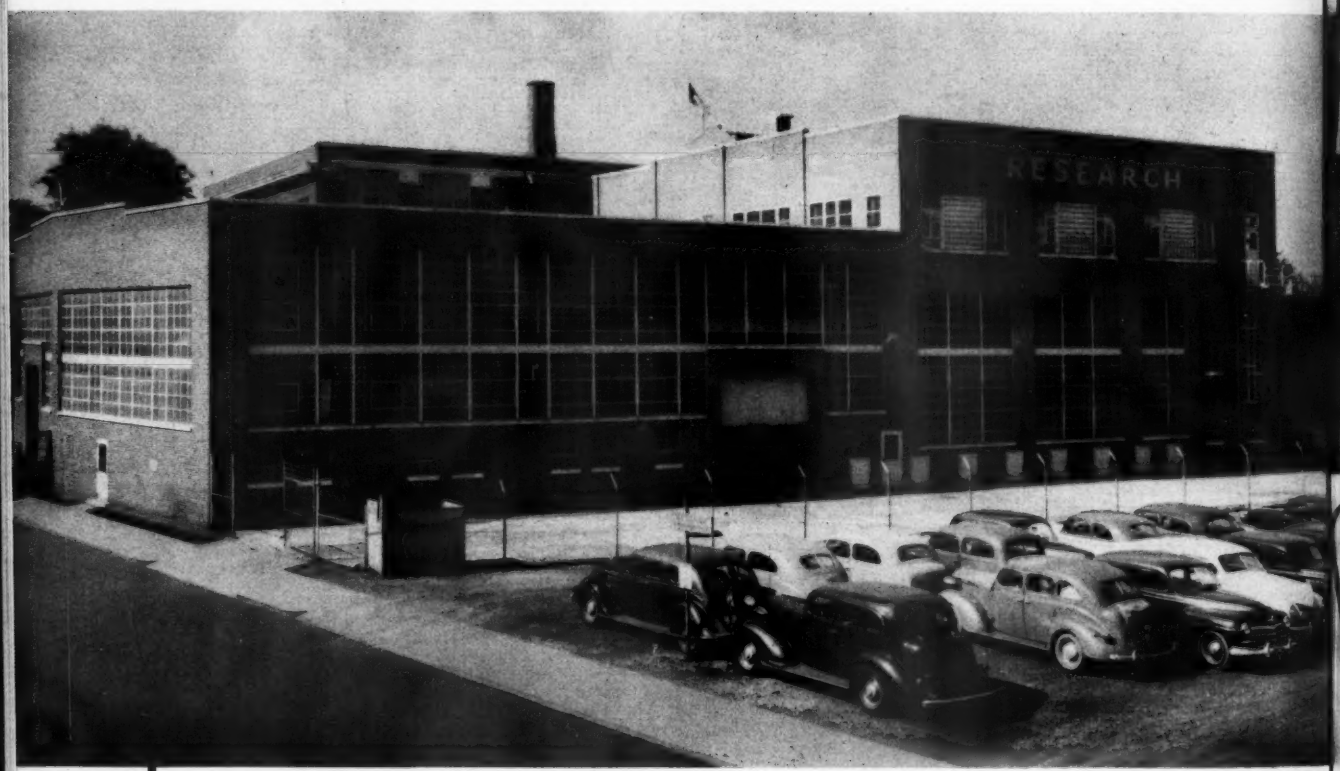

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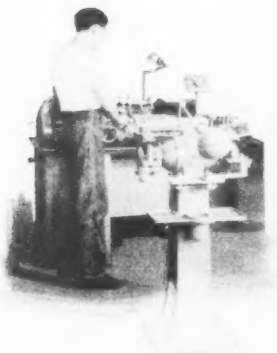

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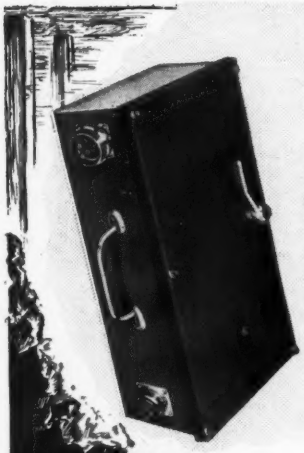
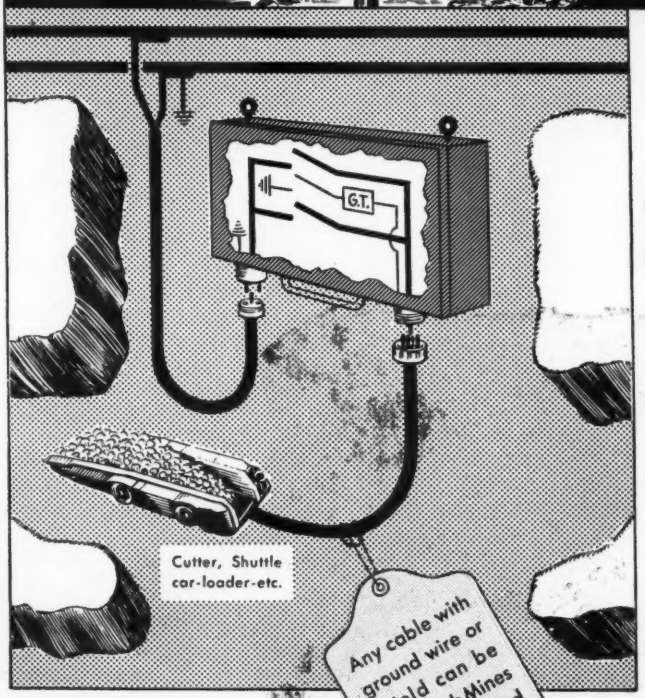


Suitcase Model Safety Circuit Center


G.T.
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- GAS IGNITION HAZARDS
- DAMAGE TO EQUIPMENT

Through use of automatic breakers, MINES Safety Circuit Centers make use of the safety ground wire in todays cables with ground wire, to obtain instantaneous "two-way" protection to personnel and equipment. In action the automatic breakers open—(1) when current drawn through breaker exceeds its normal setting—(2) when mangled cable or any insulation failure causes a flow of 5 amperes in cable's safety ground wire. Trip is instantaneous and can be rapidly reset through outside lever for repeat protection performance. Suitcase model shown has three poles (see sketch)—two for breaking line current . . . the third is wired in series through the safety ground trip to cable's ground wire. Get full details on the added protection that MINES circuit breakers with safety ground trip will bring to your mining operations, today!

WE INVITE INQUIRIES

For complete details write for MINES Equipment's Bulletin SCC 100, NOW!

Consult a Joy Engineer

EXCLUSIVE AGENTS IN THE MINING INDUSTRY

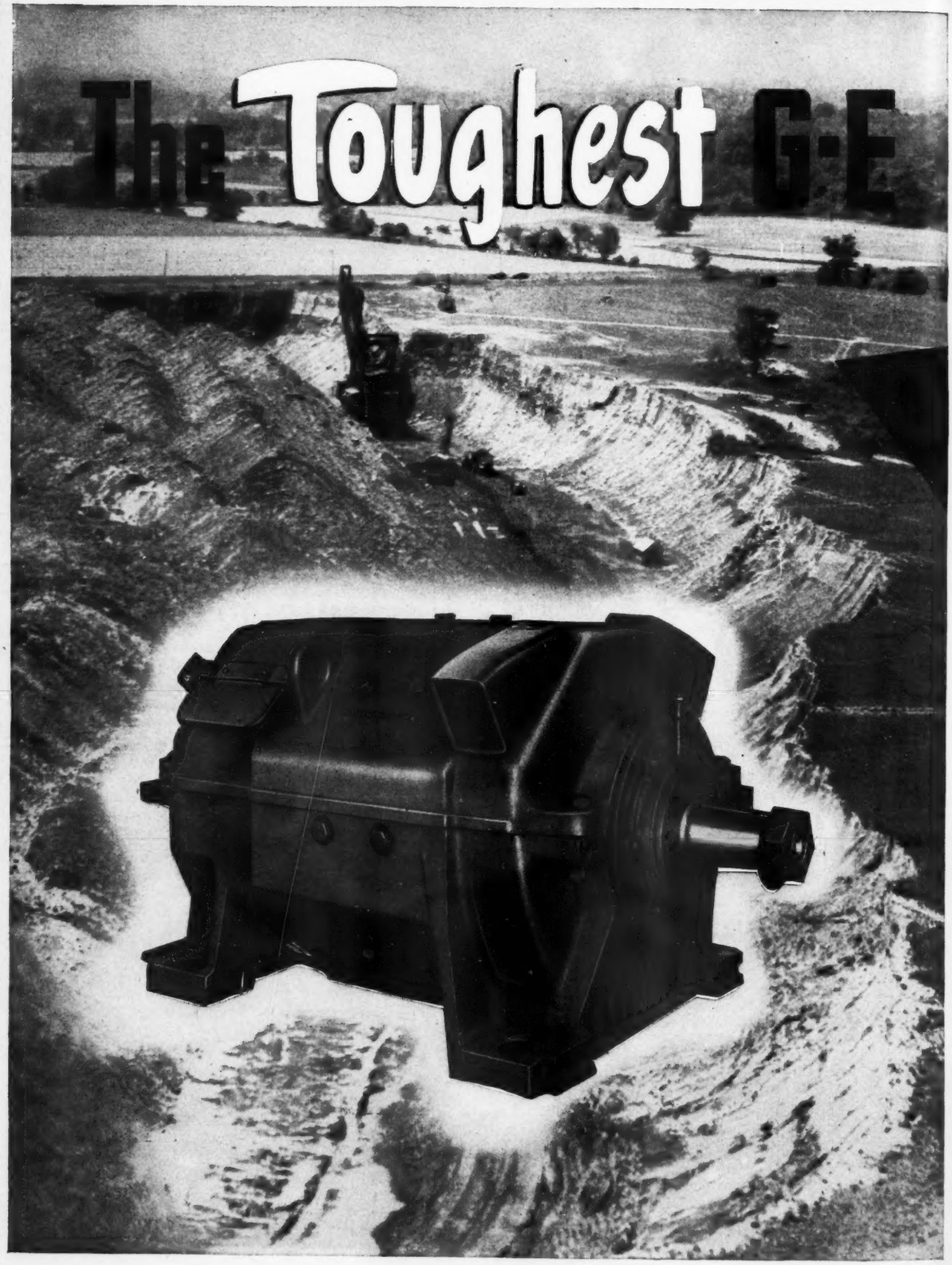
JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING • PITTSBURGH, PA.

A PRODUCT OF

MINES EQUIPMENT COMPANY

4233 CLAYTON AVENUE MINES ST. LOUIS 10, MO.


The Toughest G-E

Shovel Motor Ever Built

- Carries heavier loads safely
- Gives you more horsepower per frame
- Costs less to maintain

The new General Electric MD-600 shovel motor is the strongest, the best electrically balanced, and the most easily adapted shovel motor we have ever offered manufacturers and users of stripping shovels. Its new mechanical and electrical features will mean smoother shovel operation, less maintenance, and lower stripping costs.

The MD-600's frame is sturdier than that of any previous G-E design. The bearings are designed for a wider safety factor and greater capacity. Better commutations at all loads and speeds characterize this new motor. It is lighter and shorter and, most important, it gives you more horsepower per frame size, thanks to new design and insulating techniques.

The new MD-600 is one more good reason for specifying that your next stripping shovel be "General Electric equipped." Bulletin GEA-4654 gives all the details. It's yours for the asking. Write to *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

● **HINGED TOP**—The top half is hinged to the bottom half in frames 601 to 612 for easy inspection and repair of armature. Because of weight, heavier frames are split, but not hinged.

● **BEARINGS** — Single-width, solid cylindrical roller bearings are used in all sizes. All bearings are protected by dust-proof frameheads.

● **ARMATURE** — Low armature inertia (Wk^2) insures more horsepower output for the job. Lifting bails facilitate removal of the armature.

● **SHAFT**—The entire armature, with commutator, is assembled on a spider—a sleeve of seamless steel tubing or hollow-bored shafting—into which the shaft is pressed and keyed. Thus, the shaft can be pressed out without any disturbance to the commutator or winding.

● **FRAME**—Heavy cast-steel frame withstands severe service. It is equipped with lifting bails and with pads on both ends to mount a G-E brake.

● **BRUSH HOLDERS** —Box-type brush holders are used. All brush-holder supports are doweled and bolted, and are in a fixed position for reversible operation. Easy-to-remove plates and hinged frame make cleaning and repairing of brushes quick jobs.

● **UNIVERSAL BEARING HOUSING**—Universal bearing housing accommodates all standard makes of roller bearings without special machining.

● **COILS**—All field coils are heavily insulated throughout with mica and glass. Armature coils are insulated with silicone-binder mica tape, with glass tape for over-all protection.

GENERAL ELECTRIC

657-68

3 NEW Detachable
A Triple Threat

THE JACKSTUD
A Better Attachment

Here is the Jackstud, an Ingersoll-Rand development for attaching Jackbits, that results in increased drilling speed, ease of detachability, and longer rod life. The Jackstud design permits the use of the best possible alloy material for the attachment thereby providing strength and durability unobtainable in a one-piece drill rod. The Jackstud produces a thread attachment in the field with factory accuracy. There is no need for special machine shop equipment. The Jackstud is driven cold into the hot drill steel by the machine that is most natural to mine shop men—the Ingersoll-Rand Sharpener. Only the usual simple heat treatment is required to put it in condition for service.

Check these distinctive advantages:

Uniform, factory-perfect threads, always available on the job. No special machine shop equipment is required.

Continued easier detachability because these case-hardened threads retain their shape and resist wear.

Bits cannot lock on. The full Jackstud thread prevents the bit skirt from mushrooming.

Longer rod life results from the combination of an extremely strong, durable stud and an exceptionally large driving shoulder.

Especially adapted to small bits, with their inherent advantages, because the Jackstud attachment permits stronger construction in small bits and attachments.

Excellent performance with any commercial drill steel whether of the carbon or alloy type.

Wherever the Jackstud is being used, drilling speed and rod life are greatly increased and bits are more easily removed.

The patented method of driving the Jackstud is easy with the I-R Sharpener.

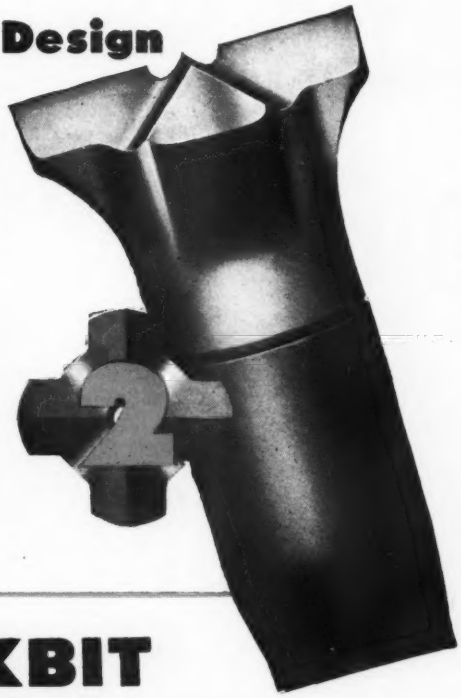
Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 39-15

AIR TOOLS • COMPRESSORS • ROCK DRILLS • TURBO BLOWERS •

Bit Developments
to Your Tough Drilling Problems . . .

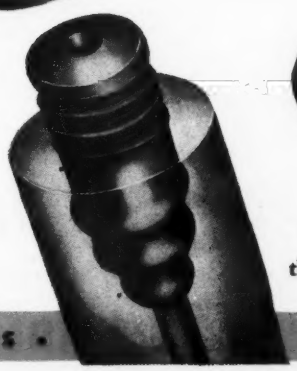
STUD JACKBIT New Design



The Stud Jackbit, a twin development with the Jackstud, was designed to fill a long felt need for a better steel bit. It drills faster, is easier to detach, and has a minimum of gage loss. The advanced design of the Stud Jackbit and rod has enabled us to place more metal in the bit, particularly at the points where it is most needed, resulting in a bit that is thick bodied and heavier throughout. This added strength permits stronger construction in small bit sizes. The higher drilling speeds obtained, size for size, with this new bit and still faster speeds obtained through the use of smaller bits, means a saving of many dollars. In addition, with the Stud Jackbit, you can

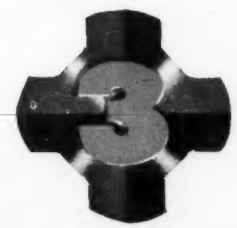
- Drill faster because of increased bearing area between the bit and rod and other advanced design features;
- Detach bits easier because of the improved buttress thread design and strong construction which resists upsetting;
- Have less gage wear because of properly proportioned wing width, gage angle, and gage length.
- Maintain new bit proportions on reconditioning because of a special curved wing design;
- Retain good bit threads because the Stud Jackbit is used with the hardened Jackstud.

THE CARSET JACKBIT
Revolutionary Performance



The Carset Jackbit is a revolutionary, new Jackbit set with cutting edges of tungsten-carbide, the hardest known metallic substance. We believe this new bit is the answer to many drilling problems. It is the fastest drilling and longest wearing rock drill bit we have ever developed.

The Carset Jackbit has all of the features of the stud Jackbit plus the advantage of a supercutting edge. It is interchangeable with the stud Jackbit.



Think what these advantages mean:

- Drill continuously with one size bit.
- Use steels as long as setup permits.
- Small, uniform diameter holes.
- Maintained high drilling speed.
- Negligible gage wear.
- Changing of bits practically eliminated.
- Adaptability to all rock drills.
- Bit reconditioning reduced or eliminated.
- Use less explosives.
- Drill the hardest rock.
- Finish more rounds per week.

Try Carset bits on your property and determine the economics of this remarkable Jackbit.

CONDENSERS • CENTRIFUGAL PUMPS • OIL & GAS ENGINES

THE BIG DIFFERENCE is in YOUR COST

REG T M

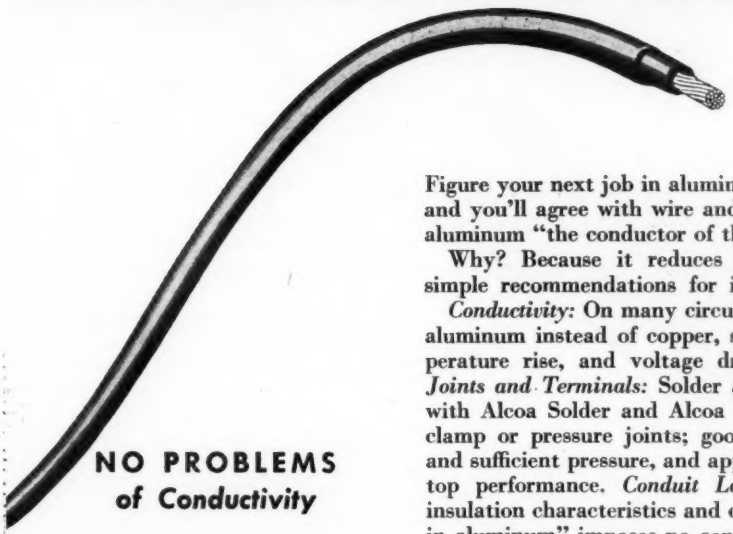
ALCOA ALUMINUM

ALCOA EC ALUMINUM

FOR ELECTRIC WIRE AND CABLE

ALUMINUM

gives you everything you want in a conductor— cuts a big chunk off your wire and cable investment!



NO PROBLEMS
of Conductivity

NO PROBLEMS
of Joints and Terminals

NO PROBLEMS
of Conduit Layout
AND
Your Supplier
Has It

Figure your next job in aluminum! See how much it cuts your costs, and you'll agree with wire and cable manufacturers who are calling aluminum "the conductor of the present and future".

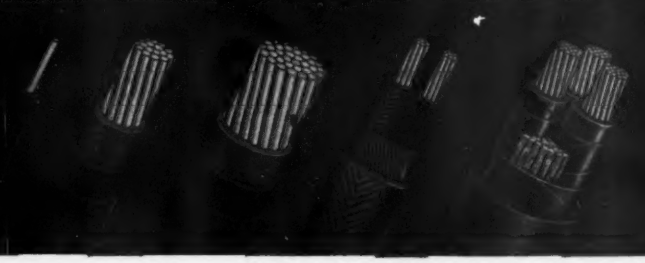
Why? Because it reduces over-all wiring costs. Here are the simple recommendations for installing it:

Conductivity: On many circuits, it will be sound engineering to use aluminum instead of copper, size for size. Type of insulation, temperature rise, and voltage drop will be the determining factors. *Joints and Terminals:* Solder aluminum to itself or to other metals with Alcoa Solder and Alcoa Flux, using standard methods. Make clamp or pressure joints; good practice calls for generous contact and sufficient pressure, and application of joint compound for lasting top performance. *Conduit Layouts:* A comparison of wire sizes, insulation characteristics and costs will show you that a job "figured in aluminum" imposes no conduit problems. And aluminum's lightness makes it easier to pull.

Your men will like the lighter weight of wire and cable made of Alcoa E. C.* Aluminum. For instance, the weight of a 500 mcm insulated aluminum cable is less than half the weight of an identical copper cable.

Aluminum conductor is here to stay. The advantage of "figuring it in aluminum" will accrue first to those mines who are quickest to adapt this modern metal to new or modernized wiring systems. Ask your wire and cable supplier, or write us for further information. ALUMINUM COMPANY OF AMERICA, 1764 Gulf Building, Pittsburgh 19, Pennsylvania. Sales offices in principal cities.

Insulated and sold by leading wire manufacturers



*E.C.: Electrical Conductor Aluminum

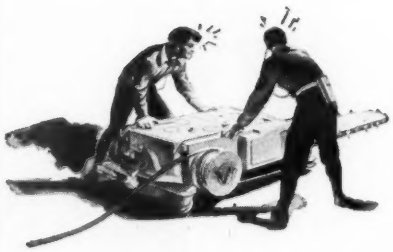
Famous for Safety and Service . . .

*Securityflex**

PARALLEL MINING CABLE

- Cuts Short Circuits
- Meets Pennsylvania Flame Test
- Withstands severe overloads
- Resists abrasion
- Will not kink, twist or tear
- Meets Bureau of Mines diameter specifications

48453



. . . Assures uninterrupted mine operation

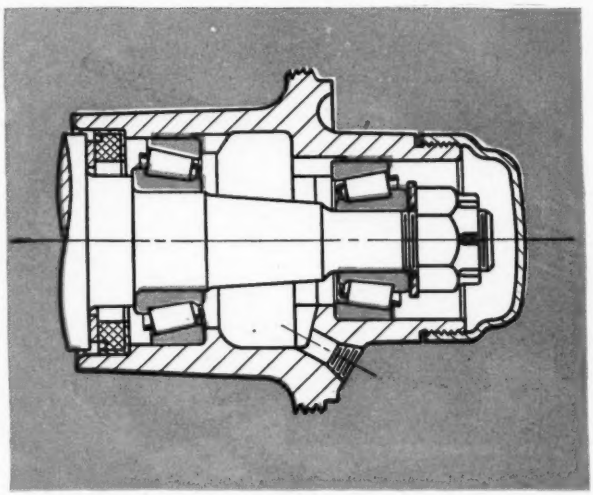
*Reg. U. S. Pat. Off.

ANACONDA
from mine to consumer

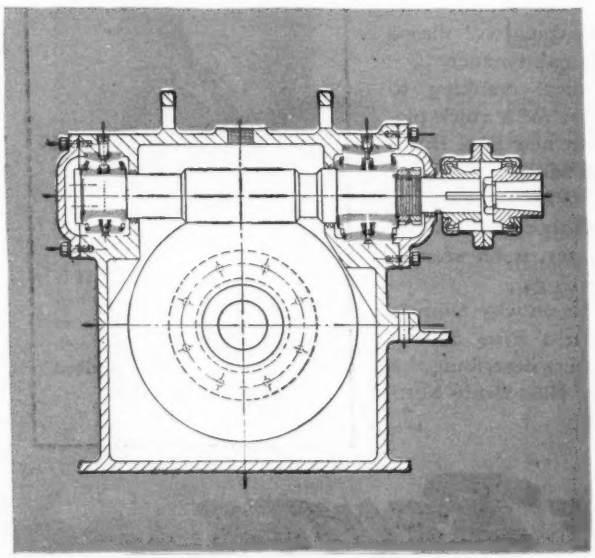
ANACONDA WIRE AND CABLE COMPANY

25 BROADWAY, NEW YORK 4, N. Y.

How to carry combinations of radial and thrust loads



TRACTOR FRONT WHEEL *in which both thrust and radial loads are carried on single row Timken bearings. From whichever way the load may come, it will be handled with minimum friction and wear.*



APPLICATION *of Timken Bearings on the worm shaft of a worm gear drive. The load on the worm shaft bearings, due to the operation of the worm, is primarily thrust. There is considerable radial load however, arising from the separating force of the gears and also possibly from overhung driving loads. This is another application for which the tapered roller bearing is ideal.*

THESE drawings show how Timken tapered roller bearings are effectively used where both radial and thrust loads must be carried. They may give you an idea for projects now on your boards.

Because it is a *roller* bearing, the Timken bearing can carry the heaviest loads. Because its rolls are *tapered,* it can carry both radial and thrust loads in any combination.

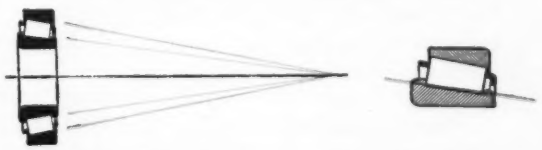
From whichever direction the loads may come, this tapered design enables the Timken bearing to carry them, one at a time or simultaneously. The cost of providing a separate type of bearing for each load is eliminated. Bearing housings and mountings are simplified, with a saving in cost, weight, and space.

For help in putting these important advantages of Timken bearings to work in the product you're designing, call upon the confidential service of the Timken engineer. He will help you select the precisely correct bearing for your job.

Remember, Timken is the only bearing manufacturer which makes its own steel. And Timken is the acknowledged leader in: **1.** advanced design; **2.** precision manufacture; **3.** rigid quality control; **4.** special analysis steels.

Additional copies of this page and further information on this or other applications of Timken bearings are yours for the asking. Write — The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN GIVES YOU THESE IMPORTANT FEATURES:



1. TRUE ROLLING MOTION
All lines drawn coincident with the faces of rollers, cone and cup meet at a common point on the axis of the bearing.

2. GREATER LOAD CAPACITY
Load is distributed along full length of roller, giving greater capacity, precision, and rigidity, with less wear and distortion.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⇕ AND THRUST →○← LOADS OR ANY COMBINATION →✳←

IN THIS CORNER... THE COST-CUTTING CHAMP!

Light in weight but a tough, tireless slugger — that's the new Blue Brute WHC (Hand Crank) Drifter, tops in its class for efficiency-plus-economy!

Easier cranking!...Assured by the rigid mounting, natural crank-handle throw and balanced action.

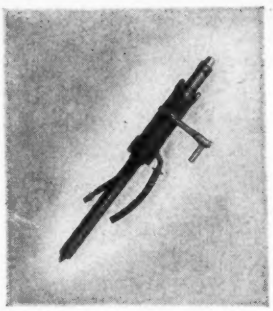
Smoother operation! . . . Sturdy one-piece shell maintains constant alignment of feed screw. Short stroking under heavy loads minimizes stuck steels.

Lower operating costs! . . . Using very little air, the WHC hits hard and fast, while blowing the deepest holes clean. And "Made by Worthington" means longer life, less maintenance.

Add mechanical cranking to these advantages for a quick picture of the other new Blue Brute Drifters — WPMS (Pneu-Motor on Shell) and WPM (Pneu-Motor on Drifter). All three come in 3″, 3½″ and 4″ sizes, *with standardized mountings*.

Get more facts on why *there's more worth in a Blue Brute*. Write for literature describing the complete line of Blue Brute Mining Equipment.

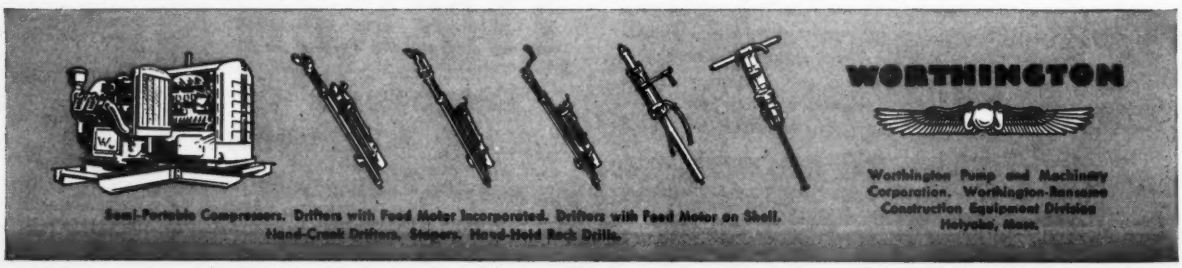
H7-13



BLUE BRUTE STOPER

Self-Rotating Model WR-31 is well balanced, easily handled and has many other features that make it a favorite with mining men. Fully described in Bulletin H-1200-B30.

BUY BLUE BRUTES

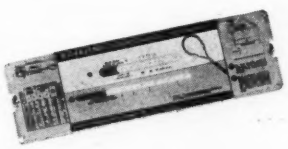

WORTHINGTON
Worthington Pump and Machinery Corporation. Worthington-Ransome Construction Equipment Division Holyoke, Mass.
Semi-Portable Compressors. Drifters with Feed Motor Incorporated. Drifters with Feed Motor on Shell. Hand-Crank Drifters. Stopers. Hand-Held Rock Drills.

ANSWERS sling QUESTIONS

NO MATTER WHAT YOU WANT to know about slings, the answer is between the covers of the Roebling Sling Data Book. 70 pages of facts about hoisting and loading materials. Details about the design, construction and use of slings and sling accessories. Information to help you handle all kinds of loads with speed and safety.

The Roebling Sling Data Book is arranged for easy use, clearly written and illustrated with photographs of various actual hoisting operations. Diagrams and tables furnish necessary technical data, and there's an accompanying price list and instructions for ordering.

The *right* slings, used *right*, can help you speed your materials handling all along the line. Write today for your free copy of this helpful data book. Ask for booklet A-899.



There's no guesswork about hoisting—with the Roebling Sling Calculator. This simple slide rule shows instantly the right size of sling for any weight or type of load—includes tables for figuring headroom and other valuable data. Send the coupon for both the Sling Data Book and the handy Sling Calculator, too!

JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
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A CENTURY OF CONFIDENCE

★ *WIRE ROPE AND STRAND* ★ *FITTINGS* ★ *SLINGS* ★ *SUSPENSION BRIDGES AND CABLES* ★ *AIRCORD, AIRCORD TERMINALS AND AIR CONTROLS* ★ *AERIAL WIRE ROPE SYSTEMS* ★ *ELECTRICAL WIRE AND CABLE* ★ *SKI LIFTS* ★ *HARD, ANNEALED OR TEMPERED HIGH AND LOW CARBON FINE AND SPECIALTY WIRE, FLAT WIRE, COLD ROLLED STRIP AND COLD ROLLED SPRING STEEL* ★ *SCREEN, HARDWARE AND INDUSTRIAL WIRE CLOTH* ★ *LAWN MOWERS*

John A. Roebling's Sons Company
Dept. 320, Trenton 2, New Jersey
Gentlemen: Please send me without obligation:
☐ Roebling Sling Data Book ☐ Sling Calculator

Name_____
Title_____
Company_____
Address_____

"NITRAMEX"

the New
Du Pont Blasting Agent
Provides More Energy
for Tough,
Bottom-Shooting

"NITRAMEX"* is used in combination *with* Du Pont "Nitramon"† blasting agent primarily to increase energy at the bottom of well drill holes in quarries, hard-rock strippings, and open pit ore mines. The blasting performance of this new product matches that of 75% gelatin . . . yet it is safer and far more economical to use.

By concentrating energy where it is needed in tough-shooting formations, "Nitramex" frequently permits wider spacing of drill holes, thus reducing drilling costs.

"Nitramex" is conveniently packed in water-resistant containers and, like "Nitramon," it can be safely loaded far ahead of firing time. It is both easy and safe to handle . . . and use.

Ask your Du Pont Explosives representative for complete information about this new and worthy companion product to "Nitramon."

E. I. DU PONT DE NEMOURS & CO. (INC.)
Explosives Department, Wilmington 98, Delaware

*Trade-mark for a Du Pont ammonium nitrate blasting agent.
†Reg. Trade-mark for nitrocarbonitrate blasting agent.

Loading a charge of "Nitramex" in bottom of 45-foot drill hole in open pit ore mining operation. "Nitramon" is loaded in top section and the charge is fired with "Nitramon" Primer.

DU PONT "NITRAMEX"

A NEW PRODUCT OF DU PONT EXPLOSIVES RESEARCH

BETTER THINGS FOR BETTER LIVING...*THROUGH CHEMISTRY*

DU PONT
REG. U. S. PAT. OFF.

The International TD-14 Diesel Crawler with bull-grader shown above served Penbrook Drayage & Supply Co., Harrisburg, Pa., in coal stripping operations. "Best machine I have used to date," says its owner!

The endorsement of operators and owners of International Diesel Crawlers in the mining industry is the best answer to any question you may ask about the usefulness and economical operation of these mighty tractors.

In the many jobs they do so well: building and maintaining access roads, stripping overburden, moving spoil banks, feeding shovels and cleaning up; they are without equal.

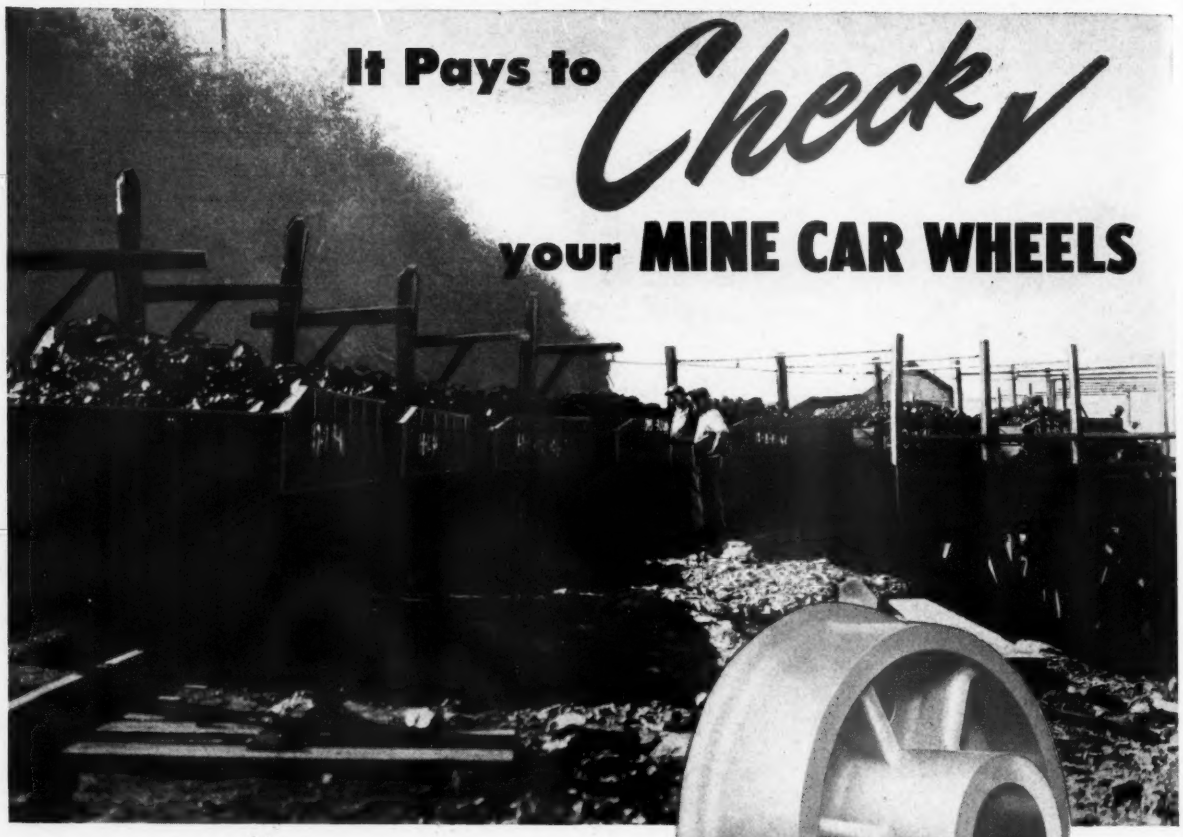
The whole story of their superiority describes their many valuable features. They are sturdily built for rough and tough service. Advanced design fuel injection assures highly effective use of fuel. An all-weather starting system eliminates time-wasting starts. Tocco hardened crankshafts and other vital parts, and replaceable cylinder liners that are file hard, assure long wearing life. Full-pressure lubrication and efficient cooling systems make sure of dependable engine performance.

For complete specifications and other information about these tractors, International Diesel engines and matched equipment, consult your International Industrial Power Distributor. Let him assist in selecting tractors and equipment for your use.

Industrial Power Division
INTERNATIONAL HARVESTER COMPANY
180 N. Michigan Avenue • Chicago 1, Illinois

INTERNATIONAL *POWER*

CRAWLER AND WHEEL TRACTORS • DIESEL ENGINES • POWER UNITS



It Pays to *Check* your MINE CAR WHEELS

WORN TREADS
"FLATS"
WORN FLANGES
Slow Down Coal Output!

a.c.f. Chilled-Tread wheels give those "extra miles" of wear, less friction on the rails which enable you to start and haul heavier loads at higher speeds.

It's the controlled heat treatment in the manufacturing process that makes the difference. a.c.f.'s wide experience in wheel design insures the proper proportion of metal in the tread and flange, hub and plate. This assures maximum strength and durability where needed.

Mine car wheels are a vital part of a smooth-rolling transportation system. Check them today! Replace worn equipment with scientifically-designed a.c.f. wheels. Our Sales Representatives will be pleased to discuss any of your transportation problems.

American Car and Foundry Co.

MINE CARS

NEW YORK • CHICAGO • CLEVELAND • WASHINGTON • ST. LOUIS • PHILADELPHIA
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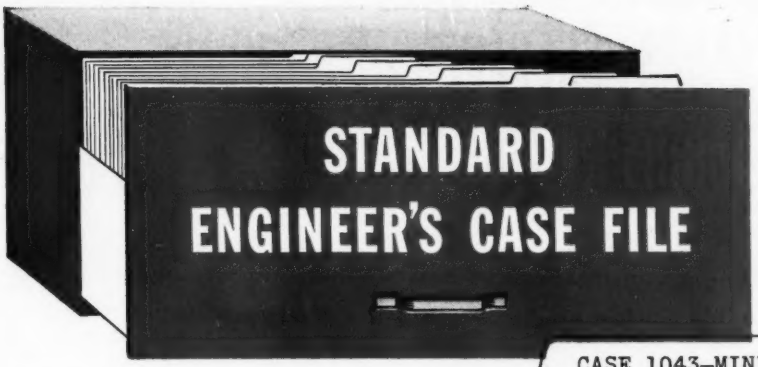
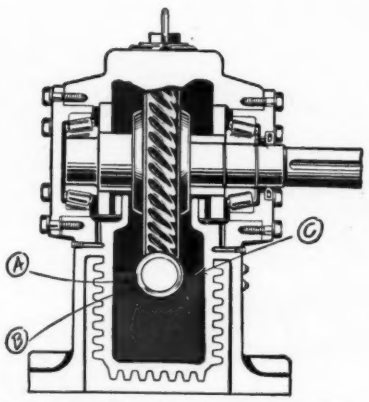


CASE 1043—MINIMIZING LEAKAGE IN LARGE ENCLOSED GEAR SETS.



AIR-COOLED WORM GEAR SPEED REDUCER

In heavy-duty industrial enclosed reduction gears the relatively high viscosity characteristics of Calol Gear Compound cut consumption. Efficient in both conventional and worm types and where such gears carry extra loads or are worn. Comes in eight grades: 60, 100, 120, 135, 150, 190, 225 and 410.

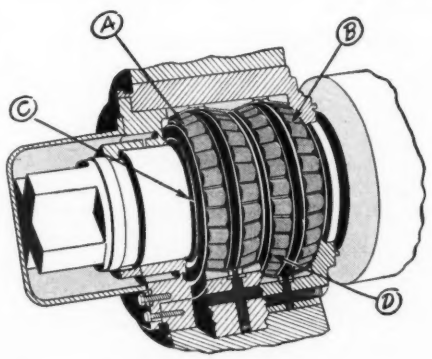
A. Oiliness and extreme pressure additives cushion shocks, prevent vibration, welding and extra wear.

B. Non-corrosive - will not harm bearing or gear metals.

C. Contains effective foam inhibitor - breaks bubbles that form and stops building up of pressure in case.

Calol Gear Compound resists high temperatures and retains good body in all operating conditions. Its numerous viscosity grades make it adaptable to a wide range of applications and conditions.

CASE 1047--KEEPING GREASE IN BEARINGS WHERE TEMPERATURES AND PRESSURES ARE EXTREME.



STEEL MILL ROLL NECK BEARING

When the temperature in a roll neck bearing reached more than 200°F., Calol E.P. Roller Grease did not run out. Excellent for all heavy-duty, grease-lubricated anti-friction bearings. Handles easily in pressure systems at all operating temperatures.

A. Contains extreme pressure additives. Lubricating film will not squeeze off under the heaviest loads.

B. Highly water-resistant - sticks on bearings even where excessive water is used for cooling.

C. Melts slowly and feeds evenly ... creeps into small clearances and assures adequate lubrication.

D. Will not corrode bearing metals.

Calol E.P. Roller Grease is made specially to meet conditions of heat and pressure too high for other conventional anti-friction greases.

For additional information and the name of your nearest Distributor, write

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street, San Francisco 20, California

The California Oil Company
30 Rockefeller Plaza, New York 20, N. Y.

The California Company
17th and Stout Streets, Denver 1, Colo.

Standard Oil Company of Texas
El Paso, Texas

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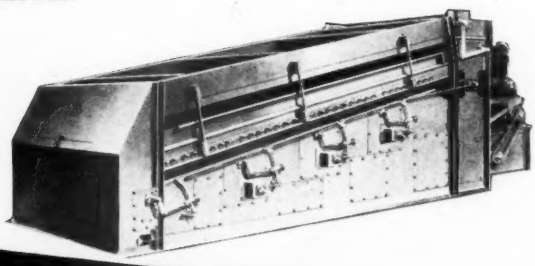

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Mining CONGRESS JOURNAL

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SHELDON P. WIMPFEN, Editor

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THE RIGHT MAN

SINCE 1910, when first established after persistent appeals from labor and management, the Bureau of Mines has fulfilled its objective, as a primary source of information to aid in the development of our mineral resources and the safe and efficient operations of our mines. The results of studies by the Bureau in its varied fields of activity have led to progressive betterment of the mining industry.

Under the provisions of the enabling act the Bureau of Mines was directed to conduct "inquiries and scientific and technologic investigations . . . with a view to improving health, . . . increasing safety, efficiency, economic development, and conserving resources; . . . to inquire into the economic conditions; to investigate explosives, . . . mineral fuels and unfinished mineral products, . . . with a view to their most efficient mining, preparation, treatment, and use; and to disseminate information concerning these subects. . . ." As called for in the law, the Director was authorized to prepare and publish reports with appropriate recommendations concerning these matters. To the credit of the Bureau, of management, and of labor, the United States has established an enviable record of mineral production with a notable reduction of accidents in an inherently hazardous industry.

Incalculable human misery has been avoided and the Nation has been the beneficiary of the services rendered by men trained under the direction of the Health and Safety Branch of the Bureau. The results of scientific safety studies, passed on to miners, to engineers in training in mining schools, and to operators, have saved thousands of lives. The Bureau has proved the effectiveness of safety education in the prevention of accidents.

In the review of Mine Safety in 1947 by J. K. Richardson, which appears in this issue, some of the problems and achievements of the safety program are noted. Mr. Richardson points out that safety cannot be legislated but is built upon the initiative of trained miners. Through the activities of the Bureau's Health and Safety Branch some 50,000 miners are trained annually in various safety courses. The alertness of miners and operators and their assiduous attention to safety precautions have effected remarkable reductions in the accident rate. Obviously, as the impossible zero point is approached, further reductions in accidents become more difficult of accomplishment. But as training in safety is extended to more miners, to apprise them of the dangers inherent in their work and the means of avoiding accidents, a fairly constant minimum rate is attainable.

With increasing public recognition of the importance of our unseen empire of mineral wealth the Bureau's work in compiling and distributing mineral statistics has constantly increased in value. During the war the data prepared by the Bureau's trained economists and statisticians were an invaluable foundation for the vast mineral procurement programs required in all-out war production.

Similarly, the technologic and research activities of the Bureau of Mines have expanded to meet the Nation's needs. They include extensive investigations in metals, nonmetallics, and liquid and solid fuels; the methods employed in their recovery, preparation, and use; the "permissibility" of the equipment and explosives used in mining; and the research that points the way towards the possible future application of heretofore untried processes.

For 37 years, under a series of able directors, the U. S. Bureau of Mines has successfully accomplished its mission of service to the mining industry and the people of the United States. With the expansion of this industry and the increasing dependence of our entire industrial economy upon mineral products, the Director of the Bureau of Mines can no longer be a specialist in any particular field of the Bureau's diverse activities. An exceptionally able staff of specialists, recognized leaders in their field, carry on the detailed work that culminates in the publication of information augmenting our store of knowledge, or in passing on to an alert employe a way of working that may save his life.

More than ever before, the need today is for a Director capable of efficiently integrating and coordinating the work of the various branches of the Bureau. Vision and imagination are prerequisites for the man who must establish a forward-looking policy that will assemble knowledge advantageous to management, labor, and consumer. A broad over-all understanding of the problems of the mineral industry and an ability to administer the manifold activities of the Bureau in a vigorous, progressive manner are exemplified in James Boyd, the present Director of the Bureau.

In the language of the act creating the Bureau of Mines, "there shall be a director of said bureau who shall be thoroughly equipped for the duties of said office by technical education and experience." Dr. Boyd, through training and experience, *is* a qualified mining man thoroughly familiar with the widely diversified problems of the industry. As chief of the Metals and Materials Section in the Office of the Under Secretary of War, as U. S. Army Representative on Program Adjustment of the WPB, and then as director of activities resulting in the reestablishment of German mines, mills, and other industries, he demonstrated his unusual ability as an efficient organizer, a clear thinker, and a capable administrator. His guidance will be reflected in the Bureau's increased usefulness to the American people.

Annual Coal Convention

Will Be Held at the Netherland Plaza Hotel, Cincinnati, Ohio, April 26-28

FOR the 1948 Annual Coal Convention of the American Mining Congress the coal industry will return to Cincinnati to hold a three-day meeting beginning Monday, April 26. A comprehensive program is being arranged by the committee; there will be sessions in the mornings and in the afternoons, luncheon meetings will be held on Monday and Tuesday, there will be informal evening entertainment and the convention will conclude with the annual dinner on Wednesday night.

This year there will be no exhibits of equipment; the entire three days will be devoted to meetings that will present an inclusive cross-section of modern coal mining. Each morning there will be only one session, permitting all present to attend and hear papers on subjects of interest to every branch of the industry—coal utilization, personnel problems, surface preparation, etc. Each afternoon separate sessions will deal with specific phases of deep and strip-mining operations that are of interest to individual groups. The complete schedule of subjects is shown in the program outlined herewith.

Mechanical mining methods of 1948, both in deep mines and strip mines, will be the underlying theme of the convention, and papers will be presented and discussed covering a wide range of practices, under various seam conditions and with different classes of equipment. Latest developments in all lines will of course be included, and there will be descriptions of new types of equipment that are already in use or in the process of experimentation. The factors that have helped to raise modern coal mining to its present high level will be brought out, the speakers placing due emphasis on management, safety, and equipment maintenance. Then, looking to the needs of the future, ways will be proposed for bringing young men into the industry and training them for positions on the supervisory staffs.

J. J. HUETHER
Chairman
Manufacturers Division

HARRY M. MOSES
Chairman
Coal Division

T. G. GEROW
National Chairman
Program Committee

The luncheon meetings will be featured by addresses on subjects indirectly related to coal but of wide interest to all mining men. The evening activities will be in the nature of informal gatherings where all can meet in an atmosphere of good-fellowship; the annual dinner will maintain the same high standard that has been followed in the past with a nationally-known speaker and top quality entertainment.

AMERICAN MINING CONGRESS ANNUAL COAL CONVENTION

Cincinnati, April 26-28, 1948

Preliminary Program

Monday Morning—April 26

General Session

1. **Opening Address.**
2. **Increasing the Utilization of Coal**—the results of research and experiments.
3. **Synthetic Oil and Gas**—for liquefaction and gasification of coal.

Monday Afternoon—April 26

Underground Haulage Session

1. **Conveyors for Main and Gathering Service**—installation and operating methods.
2. **Haulage System for Track Mounted Equipment**—operating methods, track lay-out and construction.
3. **Combination of Track and Belt Conveyors**—with belts for gathering and track for main line transportation.

Monday Afternoon—April 26

Strip Mining Session

1. **Coal Stripping Legislation.**
2. **Stripped Land Reclamation**—describing practices in several States.

Tuesday Morning—April 27

Management and Safety Session

1. **Attracting Young Men to Coal Mining**—for the future of the industry.
2. **Developing Supervisory Personnel**—for better labor relations and operating efficiency.
3. **Safety in Coal Mining**—what is needed to reduce injuries.

Tuesday Afternoon—April 27

Face Preparatory Session

1. **Machine Cutting** with tungsten carbide bits in coal and rock.
2. **Mechanical Kerf Cleaning** with the shortwall bugduster.
3. **Drilling and Blasting** using airdox for mechanical loading.
4. **Timber Setting and Recovery with Machines**—ways of saving labor and material.
5. **Roof Support with Suspension Rods**—holding the top by hangers anchored in overlying strata.

Tuesday Afternoon—April 27

Maintenance Session

1. **Preventive Maintenance for Face Equipment**—including inspection and lubrication.
2. **Belt Care and Maintenance**—to increase belt life and lower depreciation costs.
3. **Power Distribution for Mechanical Mining**—installing and maintaining an underground system.

Tuesday Afternoon—April 27

Strip Mining Session

1. **Progress in Strip Pit Haulage**
   a) Hauling Overburden in Deep Cover.
   b) Coal Haulage with Latest Type Equipment.
2. **Vibrations Caused by Heavy Blasting**—effects on surface structures.

Wednesday Morning—April 28

Surface Preparation Session

1. **What's New in Coal Preparation**—an overall review of methods and equipment.
2. **Cleaning Fine Coal Sizes**—operating problems and economic limits for mechanical cleaning.
3. **Refuse Disposal from Cleaning Plants**—types of equipment, economic factors, stream pollution.
   a) Anthracite Practices
   b) Eastern Bituminous Practices
   c) Mid-west Practices.

Wednesday Afternoon—April 28

Mechanical Mining Session

1. **Mechanical Mining** with track-mounted cutting and loading.
2. **Thin Seam Mining** with self loading conveyors.
3. **Continuous Mining**—by a newly developed combination cutting and loading machine.

Wednesday Afternoon—April 28

Strip Mining Session

1. **Draglines vs. Shovels** in deep overburden, using equipment of similar sizes.
2. **Large-scale Contour Stripping**—open-pit mining operations in West Virginia.

TO MODERNIZE A *Mental Picture*

COAL MINING, TOO, HAS "GONE MODERN"
Most of the work of mining America's coal used to be done by broad backs and bulging muscles. Nowadays, much of it is done by machine.
The timbering machine shown above, for instance, hoists and positions the heavy ceiling beams used in timbering the roofs of the modern coal mine. And this is but one of many types of coal-mine equipment . . . such as power drills, cutters, loaders, conveyors . . . now used to lessen the manual labor—and to increase the per-man production—of the American bituminous coal miner.
Today, more than 90% of all bituminous coal mined underground is mechanically loaded . . . only about 5% is mined by pick and shovel!
Thanks to huge investments in mechanized equipment, to skilled management and to keen competition in the industry, America's bituminous coal mines are the most productive—and pay the best wages—in the world. They are able not only to meet this country's stupendous needs for coal, but also to help rebuild the war-shattered economies of other nations.
Living conditions of coal miners are keeping pace with improvements in their working conditions.
Today, about two-thirds—over 260,000—of the nation's bituminous coal miners either own their own homes or rent from private landlords. And among the remaining third, who now rent from their companies, there is a growing trend to buy the houses they live in.
Home-ownership among miners is increasing—due in no small measure to encouragement and financial aid from mine owners who realize that a man becomes a better worker and a better citizen as he develops pride in "a home of his own."
BITUMINOUS COAL
BITUMINOUS COAL INSTITUTE
A Department of
NATIONAL COAL ASSOCIATION
WASHINGTON, D. C.
BITUMINOUS COAL . . . LIGHTS THE WAY . . . FUELS THE FIRES . . . POWERS THE PROGRESS OF AMERICA

● The public—your public—has a tendency to picture American coal mining as it was many years ago. They do not realize how fully coal mining here has kept step with other progressive American industries.

That's why Bituminous Coal Institute's advertising so often dramatizes modern mining methods . . . repeatedly tells how huge private investment and skillful management have made American bituminous coal mines by far the most productive in the world.

To help bring other businessmen and the general public up to the minute in their ideas about your industry, Bituminous Coal Institute advertisements like the one above appear regularly in *Time, Newsweek, Business Week, Iron Age,* and *Pathfinder.* And this is only part of the big job being done in many ways and on many fronts. Now going into its fifth year of increasingly effective operation, the broad program of Bituminous Coal Institute merits the full support of every forward-looking bituminous coal operator.

BITUMINOUS COAL INSTITUTE

A Department of
NATIONAL COAL ASSOCIATION
WASHINGTON, D. C.

BITUMINOUS COAL . . . LIGHTS THE WAY . . . FUELS THE FIRES . . . POWERS THE PROGRESS OF AMERICA

MINING'S

Annual

REVIEW

AND

FORECAST

Gathering conveyors concentrated mine output and their increased use points toward lower costs

New Trends in Coal Mining

FOR peace-time production, the bituminous coal industry in 1947 achieved a record high, mining 619,000,000 tons of coal and approximately equaling the all-time high of 620,000,000 tons produced in the war year of 1944. The accomplishment is all the more remarkable when we consider that it was made by men who were no longer under war pressure, that the work day had been shortened, and that the industry was, through necessity, continuing to use many of the 1941 machine models for cutting, drilling and loading. Although the over-all production has increased, it will be noted, as shown elsewhere in this issue, that there was little change in the percentages of the total production mined with mechanical loading and the percentages cleaned at mechanical preparation plants.

From a technological viewpoint, coal mining during the year 1947 was still in the post-war era—which is to say that the industry, through no fault of its own, had not yet progressed far along new lines. There had been a few changes but certainly no radical advance from the practices and equipment used six years ago, and a brief review of what happened during and since the war will explain why. In 1941, coal-mine mechanization had been proven to be practicable, and the idea had been accepted that machines would replace hand labor underground. With this in view, plans were being made for new and improved types of equipment and new operating methods; but at that time, most of such plans were in the drawing board stage. Then the war came and for the next four years there were neither the time nor the engineers available to perfect new machines. Consequently the industry had to get along with the equipment models already in use; in addition, quite a number of obsolete machines, actually headed for the junk pile, had to be put back into service. As soon as the war ended, there was an immediate and insistent demand by the coal companies for new mining equipment to replace the worn out units but these companies could not wait for new types to be designed. They were under pressure to produce coal and naturally passed this pressure on to the manufacturers who had no choice but to continue to build the 1941 models, with of course some improvements added. That condition to some extent still exists, although it is rapidly being corrected.

A clearer understanding of the situation may be had by comparing the coal industry with the automobile industry. The conditions are similar. During the war, obsolete and "bad-order" cars were in constant use. Actually they had no business being on the streets and roads, but they were all we possessed. Then, with the end of the war, we confidently expected a flood of new designs, but in that we were disappointed. Even to this day, with thousands of cars coming off the production lines, the majority of these are still in the 1941 class.

Looking to a Prosperous Future, the Industry Resumes Development of New Equipment and Methods

Going back to coal mining, it appears that better times are ahead. During the war years, a number of new ideas were being worked out and now that some of the pressure for supplies and machines is beginning to relax, the first of the year 1948 finds the industry starting to adopt some new ways. The stimulus is economic; more dollars are being paid for labor and material, and if coal is to maintain its competitive position in the fuel market, it must produce more tonnage for the dollars that are so spent. As a corollary, the quality of the product must be maintained on a high level, again for competitive reasons. All of this is resulting in some definite trends which will be outlined briefly.

An outstanding development, which has progressed beyond the "trend" stage has been the application of rubber to underground transportation—pneumatic tires for mobile machines and belt conveyors for coal haulage. It may be that the shortage of steel accelerated the development, but even without this impetus, rubber tires and belts would have gone ahead on their own merits. Track and mine cars have not lost any of their efficiency and under certain conditions rail haulage will maintain its supremacy as a method of transportation. However, pneumatic tires give great flexibility to mobile machines and belt conveyors can serve effectively on steep grades. This has immediately put into the operating class a number of pitching seams which otherwise would have been uneconomical for mining. But there is still more to come—the latest development is a conveyor a mile or more in length with a single belt and one drive. This will have a far-reaching effect on our mining systems.

Coal-preparation facilities were increased during 1947, but almost without exception the new plants built and the new equipment added to existing plants have been of the same design and use the same processes that have been employed over the past years. For the average seams, and to make the usual market products, these processes are altogether adequate. But now a situation is arising where the seams of clean or nearly-clean coal are becoming exhausted. Consequently the industry is facing a future where greater quantities of impurities must be handled and removed. New processes, including electrolytic and "heavy-media" separation, are under development and several plants of these types which are beyond the pilot class are now going into operation.

Intensifying the preparation problems is the movement toward "full-seam mining." Having demonstrated over the past years that mechanical cleaning is economical and effective, the industry is planning to give the preparation plants more work to do. Here again, the underlying reason is to reduce the production costs. Where seams have heavy partings or draw slate, separate rock loading underground by machine or hand picking at the face causes too much delay to a mechanical-loading unit and also requires too many men. The answer is to load the entire seam of coal and slate together and make the separation at the mechanical-cleaning plant on the surface. This method is in successful practice at quite a number of mines and their experience seems to forecast that the preparation plants of the future will be designed for the double purpose of improving the quantity of the coal and eliminating the underground and surface labor of hand picking.

There is a marked trend toward an increased coal recovery with mechanical loading. This is not a new idea as pillars have been extracted as long as coal has been mined and also, pillars have been recovered mechanically since the first loading machines were put in operation. However, the practice has not been too widespread in the past but the present high cost of mining is bringing about a change. It is self-evident that money spent for track, wiring, timbering, etc., all go against the cost of coal, so it naturally follows that the more coal pro-

In 1947, near-record production came from the shafts and portals of bituminous coal mines

duced by these facilities, the lower the cost of that coal will be. As a means to produce more tonnage from a developed area, greater attention is now being directed toward pillar extraction in one form or another, or at any rate toward recovering higher percentages of a coal seam. Conservation of natural resources is a factor but the real incentive is the necessity to get greater production to pay for the labor and material used in mining.

Another underground development which is steadily growing is the mechanization of auxiliary operations. Although it is true that the major cost in a mine is for the productive work of cutting, drilling, shooting, loading and hauling, the maintenance and dead work add up to quite a sizable sum. This is leading to some new ideas, a few of which are already started. The cost of holding the top, or to put it another way, the high cost of cleaning up roof falls if the top is not held, will often make the difference between profit and loss in a mining operation. On the other hand, with the present high labor rate, the work of setting the timbers is an appreciable amount. This has brought into operation mechanical timber setting and, because timbers are now costing real money, the next step along this line, which incidentally is well under way, is the recovery and reuse of timbers. But going further, experiments are now being conducted to eliminate the use of posts by holding the top with suspension rods anchored into a strong strata overlying the mine roof. This method may prove practicable and certainly has attractive possibilities.

A new idea which seems about ready to pass from the experimental into the practical operating stage is a plan for "continuous mining," by a machine that in one operation will cut the coal from the solid and load it into the transportation medium. A machine which does these two things has been used in Illinois for the past 20 years but its application is somewhat limited; the new type now under development is designed along different lines and will be adaptable to a wide range of seam conditions. This will mark a most important forward step in the art of mining coal.

Coal-Mine Mechanization

By NEWELL G. ALFORD
Consulting Mining Engineer
Pittsburgh, Pa.

CONFIDENCE and calculating audacity, by erstwhile standards, are progressively dominating the attitudes of coal-mining personnel in adapting mixtures of mechanized methods and successfully by-passing "local conditions" with ingenuity and new equipment. Practical experience, from the face to the front office, has fostered faith and enthusiasm up the line, adjusting orthodox caution to willing conviction.

So goes the more recent story of mechanized coal mining while developing a "bull market" for economical extraction devices. The manufacturer's challenge is new-model design; and salesmen, not by any means extinct, temporarily have been forced to the ways of diplomatic agents.

Seriously, the operating executive ponders how well his company can meet future competition. How obsolescent is his equipment? How soon will possible future savings pay for more economical replacements? To meet these questions, replacement studies are getting generous attention with a realistic approach to the ultimate in low cost for maintenance and repairs; meanwhile, intensified mechanization is at production line proportions.

Manufacturers are awakening to the customer-value in more factual obsolescence expectancies which, of course, are directly coupled with the probable future advances in the art of machine design. For operators and manufacturers there is today a golden opportunity for cooperation.

Large-scale development of full-seam mining methods, supplemented with surface coal cleaning, has resulted in higher degrees of underground concentration and has contributed to more intensified mechanization and greater variety in combination of equipment. Coal seams containing high ash laminations, and formerly regarded as of mediocre quality, have become potential quality-coal reserves with full-seam methods. With such facilities, and with mechanical cleaning, coal seams with binders and partings are of present commercial value, if mined cheaply enough with competitive freight rates to favorable markets. Thus a newer element has a bearing on the relative value of coal in the ground.

In the past year, mining companies have been more conscious of the possible competitive potentials in a coal market depressed by a business recession—directly related in many ways to the needs for the most efficient and most economical mechanization. Anticipation, as an important factor in mine management, has become definitely vital with mechanization advances.

There is the question of the relatively small operator's possible abil-

U. S. Bureau of Mines Development Laboratory for synthetic liquid fuels

ity to finance equipment for competitive operation. The answer, of course, will be relative. Assuming the property is closely controlled and aggressively managed, financing of new equipment would be justified by past performance, quality of management, expectation, and other usual qualifications.

Manufacturing competition, and ingenuity in design is speeding the availability of more highly mechanized facilities. Gradually, but relatively fast, manufacturers are trending toward production of units with larger shift capacity. As this ideal is approached, the mechanical face-cycle of coal digging and loading will naturally become synchronized with more efficient and continuous types and layouts for transportation.

Too much cannot be said for the contagious enthusiasm and ingenuity of practical underground personnel and its aptitude for by-passing apparent mechanical obstacles. These men are rapidly removing many of the traditional limitations in underground methods, and the result is shown in the continually increased tonnage produced by mechanical mining. In 1947, hand mining accounted for only 32 per cent of the total bituminous production; 46 per cent was mined mechanically underground, and 22 per cent from strip operations on the surface. Considering only the underground tonnage, 60 per cent of this was produced by mechanized loading.

We are, without doubt, well advanced in a formative period where entire organizations have absorbed the aggressive spirit of coal-mining mechanization. This spirit is a younger-group characteristic and is reflected in habits of thought, attitude, planning, execution, and organization—a definite asset for the industry's future.

There are two other factors in the outlook for coal production and both of them are relatively long-range aspects. The first of these is the possible effect of the direct conversion of coal into oil and gasoline when this becomes a commercial reality. From all present indications I would expect such a development to supplement our domestic oil production and reserves, so that they may be conserved for military purposes. The second of these potential influences would be the possible large-scale gasification of coal in place. There are several sound physical reasons for expecting that commercial development of this method is much more remote than the conversion of coal to oil. I will not discuss the possible economic influence of these two factors for the reason that they are being covered elsewhere in this issue, although the remoteness of one and the probable absence of competition from the other make for a brighter future in coal mining.

Some Economic Aspects of the Coal Industry

By GEORGE F. CAMPBELL
Vice President and General Manager
Old Ben Coal Corp.

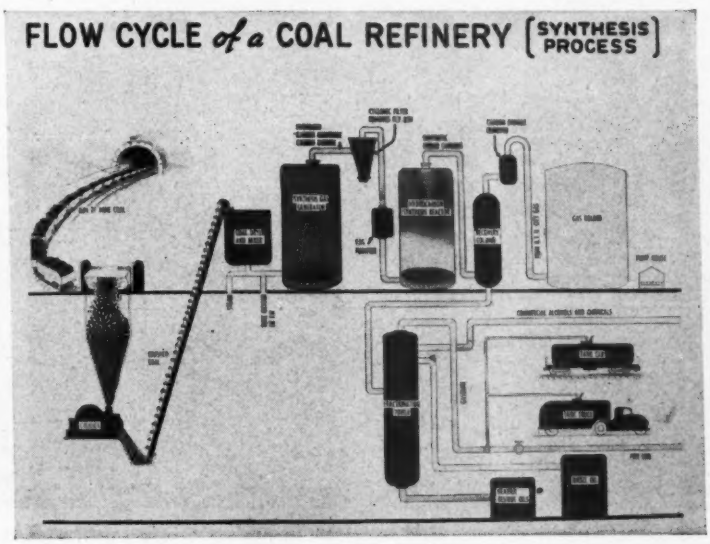
TWO years ago some members of the coal fraternity were mournfully predicting that the use of gas and oil for fuel would ruin their industry. Yet 1947 saw the largest peacetime production of bituminous coal in the history of the country, approximately 620 million tons.

The past year also saw an extreme shortage of oil and natural gas and it is at last becoming apparent that coal is the basis of the nation's economy; its reserves being practically inexhaustible, whereas the reserves of oil and natural gas are limited.

As this is written, early in 1948, many users of oil and gas, from the Midwest to the Atlantic Seaboard, are experiencing considerable inconvenience and some hardship through the lack of adequate heat in homes and offices. The need for production of synthetic fuel oil and gasoline is the result of shortages and the country is searching for commercial methods to extract these products from coal. Such research is being conducted in part by individual oil and coal companies and partly by governmental agencies. Undoubtedly some method will be found that will give us sufficient oil and gas from coal to continue the ever-increasing use on the farm, the highways, the home, and the railroads.

Those railroads that went all-out for Diesel locomotives had difficulty in 1947 in obtaining an ample supply of fuel oil and it is said that the scarcity of fuel oil will retard the purchase of Diesel locomotives in the future. Coal-burning locomotives of increased efficiency and the coal-burning, gas-turbine locomotive now under development are being watched with intense interest by railroad men who realize that the Diesel-oil supply is not unlimited.

On July 1, 1947, a new wage agreement became effective between coal operators and the United Mine Workers of America providing for an eight-hour, portal-to-portal day inside the mine, as compared with the nine-hour,



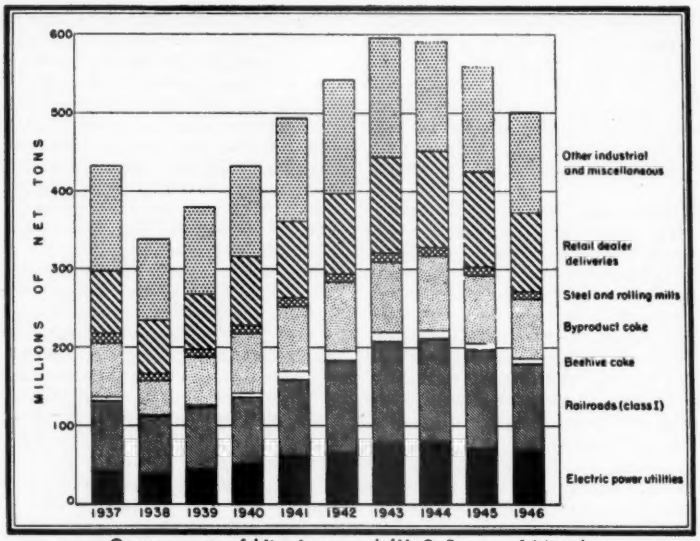
portal-to-portal day that prevailed prior to July 1.

This reduction in working hours curtailed production in individual mechanized mines, although the total production in the country increased. The reason for this is that during the year there were many strip and ramp mines opened, particularly in the East, which made up the tonnage lost by the reduction in working hours. In the Middle West, where there were few such mines opened during the year, and where practically all mining is mechanized, production was not increased.

Inasmuch as labor constitutes from 60 to 65 per cent of the entire cost of mining coal, it is the item most closely watched by operators in order to produce a product that will sell at a price in competition with other coals and with fuels other than coal. The increased cost of labor under the wage agreement that became effective on July 1, 1947, ranged all the way from 50¢ per ton to $1.50 per ton, depending on the individual mine. Strip mines, because their labor cost is a lower percentage of total cost than is the case with deep mines, probably had the lowest increase in labor cost under the new agreement.

The basic rate for inside work is $13.05 per day, $65.25 for a five-day week, $84.83 for a six-day week and $110.93 for a seven-day week. The sixth consecutive day is paid at time and one-half and the seventh consecutive day at double time. Bureau of Labor Statistics reports released in Jan. 1948 showed average weekly pay to all bituminous coal miners as $71.87. Compare this figure with those of the following industries:

	Per week
Factory workers	$50.98
Durable goods workers.....	54.66
Automobile workers	60.71
Non-durable goods workers..	47.17
Electrical machinery workers	60.71



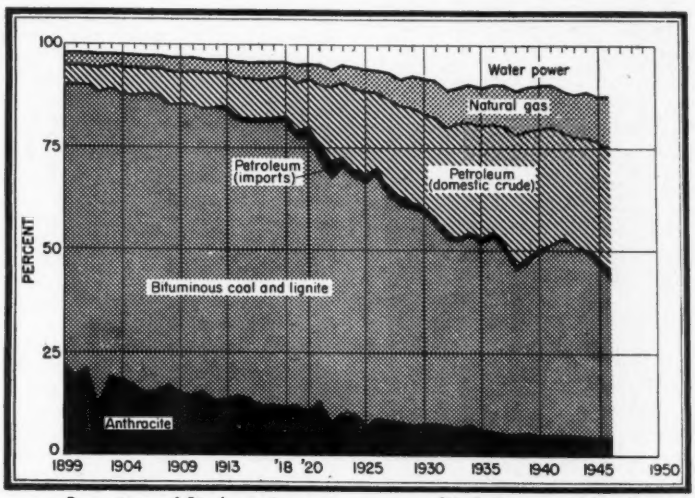
Consumer use of bituminous coal (U. S. Bureau of Mines)

How much further, if any, mine wages can be increased without disrupting the entire economy is a matter for conjecture. We old-timers look back to the Jacksonville Agreement whenever this subject is discussed. The years from 1924 through 1928, when the Jacksonville wage scale was effective, came close to bankrupting companies employing United Mine Workers of America and also came near seeing the disintegration of this

Gasification tests of unmined coal were conducted at Gorgas, Ala.

great labor union. Another Jacksonville would certainly be deplorable.

As is always the case when labor costs are high, operators cast about for methods to further mechanize their properties in order to reduce the number of men employed. One manufacturing company has developed a machine for continuous cutting and loading that will eliminate the use of explosives and blasting devices. This machine is said to be past the experimental stage and will probably be in production within another year. Other research is being conducted toward the development of a similar machine by a group of operators and by several individual companies. Such a unit, if perfected, will go far in reducing the cost of mining.



Percentage of Btu by various energy sources (U. S. Bureau of Mines)

In the Middle West particularly, there has been a continuous switch from large sizes of coal to fine sizes. Coals for use in domestic stokers are in large demand and have been extremely scarce all year. The continued increase in this demand is being met by operators as best they can by introduction of additional screening, crushing, and conveying machinery.

With 50,000,000 net tons of coal to be exported in 1948, and with the utilities supplying 11 per cent more power than heretofore and projecting a much greater supply, a healthy demand for bituminous coal throughout the current year is assured.

Coal Preparation

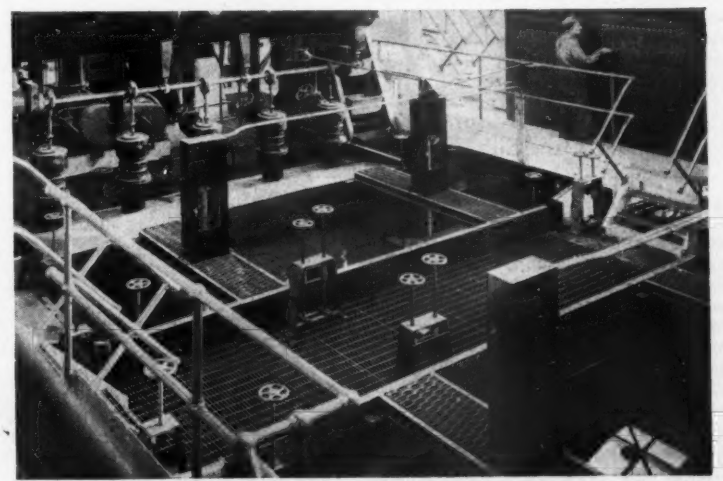
By HENRY KINSMAN
Preparation Manager
Franklin County Coal Corp.

AS in each succeeding year in the the past decade, 1947 has shown an increase in the production of mechanically-prepared coal. New and more efficient mining methods can be expected to necessitate a further increase of mechanically-prepared coal in the future.

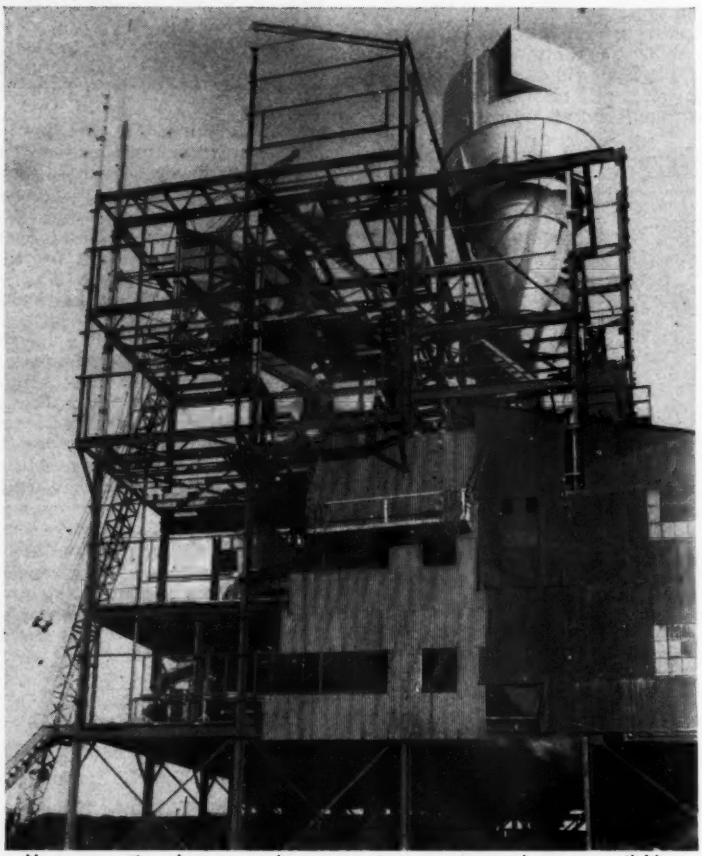
High cost and expense have characterized the past year and to compensate for this handicap, producers have had to strive towards increased production at the lowest attainable cost. More tons have been mined by mechanization and this movement has resulted in an increased amount of impurities in run-of-mine coal. These increased amounts of impurities, generally, have been concentrated in the sizes that are confined to the domestic market, primarily screenings and stoker coals. In a highly-competitive stoker market, as exists in southern Illinois, the minimum price tends to be the selling price and the production of good quality stoker coal becomes a "must." Similar to all markets, in the domestic coal market the consumer's requirements are the primary objectives in production. The coal consumer's requirements are encompassed in two factors, "adaptability" and "uniformity." The consumer is interested in the economic utilization of the fuel purchased, and can only afford to pay for the uniformity of the prepared product. The producer cannot hope to profit from any part of his preparation which does not add to the utilitarian value of his product.

Many preparation plants have been designed for the utmost flexibility and are able to produce a great variety of sizes and mixtures. Flexibility continues to be the keynote in all new plant construction as a changing market dictates its need for different types of coal.

Construction materials for plant de-



Cleaning plants enable production of specification coal to meet consumers' needs



New preparation plants are under construction as equipment becomes available

velopment are still difficult to obtain but the supply situation has been greatly eased since the war. As a result, new plants are under way and plans for more new plants will materialize.

There have been no new processes for the mechanically cleaning of coal developed in this region. The increases in mechanized equipment has been toward expanding existing plants to prepare greater tonnages, and to the construction of new plants where none had previously existed.

Air Cleaning Adaptable To Fine Coal

Throughout the field practically all types of processing plants can be found. One of the noticeable trends in the past year has been the conversion to "air-flo" tables for fine coal sizes. The air-cleaned coal seems to be a suitable improvement for the consumers of stoker coal and screenings. Wet coal cleaning down to ¾-in size has little detrimental effect in freezing weather, eliminates moisture difficulties, and provides for an economical limit to a given ash content. "Air-flo" cleaning has favorable aspects for stoker preparation and plant economics. The savings in anti-freeze equipment and the buying of coal that will "roll" in freezing weather has appreciative qualities for both the consumer and producer. "Air-flo" machines are limited to cleaning coal below the size that cannot be satisfactorily dewatered, after wet-washing, without the purchase of necessary drying equipment.

Installing both wet and dry cleaning has all the prospects of being an economical combination for the producer. New developments on dust collection and exhaust control have resulted in low exhaust loss. The exhaust loss definitely overshadows the problems of sludge and sludge loss or the annoying difficulties of its recovery.

"Heavy-Media" Process Gives Clean Separation

Adaption of the "heavy-media" process to coal cleaning has definitely promising possibilities. The ability of the process to clean a wide-range feed at a sharp separation, along with limited mechanical parts and small working area, makes it a preparation plant of satisfactory aspects.

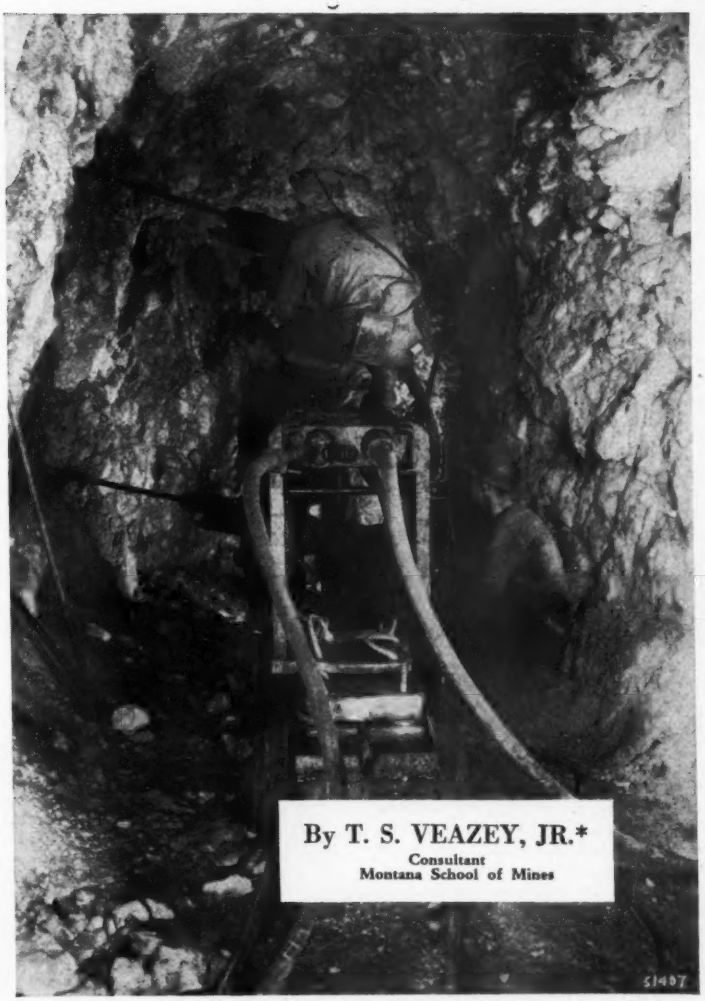
Washing plants used in conjunction with the "heavy-media" process clean down to 10-mesh with 0.5 per cent float in refuse and 0.5 per cent sink in clean coal. One plant now in operation is washing 400 tons per hr with consistent results. Varying tonnages have little effect on the character of the product.

The possibilities of gob fires and stream pollution as by-products of coal preparation have hardly been improved. Smoke from these fires are becoming a highway hazard and the odors are demoralizing to residential families located close to preparation plants. By means of new plant design for middling treatment with secondary recovery, there will be some reduction of combustible material in washery refuse.

Reclaiming coal from sludge has been developed profitably by the Pyramid Coal Corp. Profits that may be derived from the sale of coal recovered from sludge will substantiate the need for their reclaiming program.

Cleaned coal starts to market

Mining Equipment Trends



By T. S. VEAZEY, JR.*
Consultant
Montana School of Mines

A variety of jumbos meet special problems of mine development

As Smoke Shows the Way the Wind Blows, So Do the Trends in the Application of Mining Equipment Indicate the Most Advantageous Usage of the Tools Available for the Production of Mineral Wealth. Here a Research Engineer Points the Path of Progress Towards More Economic Mining Practices.

PROBABLY more intensive development of rock drill bits was undertaken in 1947 than in any previous year. The alloy stud insert connection for detachable bits was introduced. Several manufacturers have announced tungsten carbide insert bits. Footages are claimed which exceed the normal life expectancy of the drill steel itself. In their present state of development, these insert bits have been found to have economical application in some kinds of rock. However, the high unit cost has discouraged their adoption where loss or theft would be difficult to control. At least one important manufacturer of bits has refrained from entering the field on the ground that the insert bits are not yet foolproof and that there are too many limitations in their use. Hard facing of bits appears to offer promise, but is still in the early development phase.

More and more attention is being given to the "one-pass" bit, of which several types are now on the market. These bits have the advantage of low cost and some have simple means of connection. Their use does away with the entire problem of resharpening, a process involving equipment, shop personnel and quality control.

Smaller Holes Increase Drilling Speed

In drilling practice in this country the trend is towards smaller holes, faster drilling, lighter steel and lighter machines. This is in line with Canadian practice that has been in effect for a number of years. There are exceptions to this, of course. At one property in the iron country, for all drilling in sub-level stopes, the size of holes has been increased to 2⅝ in. Carbide insert chisel-type bits are used and holes are loaded with specially prepared powder in large diameter sticks about 22 in. long. Here the objective is fewer holes with an increase in the breaking factor per hole. In open-pit mining some experimental work is being done with the same objective; holes are being drilled up to 12 in. in diameter and loaded with specially packaged explosives.

In either case, the economic balance must be determined by the speed and cost of drilling, powder consumption and results, particularly the degree of fragmentation produced. Underground, the recognized tendency of miners to overload holes must be taken into account. Bigger holes have greater taper when drilled with ordinary gage changes, and the amount of overload is greater towards the collar of the hole, where powder is of the least use.

Fusion piercing is one of the most interesting developments in "drilling." Given oxygen at low cost, it is possible

* Assistant Research Engineer, Anaconda Copper Mining Co.

that this technique may find application in certain types of underground operations.

In conventional drilling the use of long rounds in tunnels and drifts is far from new, especially in ground which breaks readily. A development that is new is the burn cut with an oversize center hole, developed by International Nickel. This hole is first drilled with standard-size bits, then "reamed" with an oversize bit on a pilot rod. The oversize hole is thus completed in a reasonable length of time due to the fast chipping action of the reaming bit, and the large hole gives free space to which the deep cut holes can break.

Experience with the new small bits generally indicates that they perform best with light machines. New machine designs, especially in the drifter class, provide for lighter drills with faster hitting action. At the other extreme, one manufacturer has built a 6-in. wagon drill operating on the same principle as the old "slugger." Holes are drilled larger than would be practical with present percussion drilling tools, but smaller than with churn drills. Relatively high drilling speeds are attained as the blow of the bit is delivered under power. The objective of this piece of equipment is to drill holes enough faster so that the job can be done in less time even though more of the smaller holes may be required. Hollow stem equipment permits either the use of compressed air to clear cuttings from the drill hole or wet drilling where necessary. A dust collector is incorporated in the machine. The unit includes a diesel-driven compressor and is self-propelled on cat tracks.

Tappet-type Leyners Produce Less Dust

Investigation of rock drills, as related to dust produced in drilling, has shown that tappet-type leyners produce less dust than the lug-chuck type, and that the difference in drilling speed is less than 10 per cent. Use of a large water tube with a close fit between tube and tappet and piston reduces air leakage to the water stream. This has supported the trend towards the use of straight-shanked steel.

Various types of drill jumbos are now available commercially. These have been described adequately in other articles. Aside from mechanical features, the newest thing in this field is the application of jumbos to drilling in stopes and shafts, under conditions such as those in the Coeur d'Alenes. For drifts, the hydraulically operated drill jib, with machines mounted on booms, represents an important forward stride. This type of mounting takes the hard work out of handling machines and makes possible a better, faster drilling job. The principal problem involved at most mines is that of planning for quick disposal of the broken muck and places for the jibs to be kept in use. Where drilling conditions permit, long steel are being used, drilling holes up to 10 ft with a single bit. Pneumatic columns and pneumatic feeds are coming into increased use, cutting down the time and work involved for setting up and for changing steel.

Timber-setting trucks have been devised using the same hydraulic boom lift as a drill jib. With this apparatus roof timbers weighing up to 900 lb can be raised directly to a back as high as 12 ft above track level.

For handling rock, equipment heretofore used almost exclusively in coal and nonmetallic mines has been adapted to hard rock conditions. Loaders and shuttle cars, both cat-tracked and rubber-tire mounted, are now seen in tunnels and hard rock mines. The muck-handling capacity of some of this equipment is such that drift driving may well be revolutionized if the machinery proves rugged enough to take the punishment of hard rock service.

Mechanical Equipment Improves Shaft-Sinking Practice

In slushing equipment, folding scrapers and one-piece, cast-alloy scrapers are innovations. More compact and powerful motors are being incorporated into hoists. No particularly new applications of slushing have come to notice save possibly that of scraping into skip measuring pockets where cars dump to a slusher trench instead of to a storage pocket. With sticky, wet ore this method of loading has been found faster and more efficient than the gravity handling system that it replaced.

The Riddell clamshell mucker has continued to gain in popularity for shaft sinking. The apparatus has undergone improvement in design so that it is now operated by one man. There has been developed by Calumet & Hecla an ingenious method of sinking inclined shafts on slopes ranging from 20° and 45° from the horizontal. It consists essentially of a three-drum tugger hoist and scraper which serves to scrape the muck into a large pan. The pan, when filled, is dumped pneu-

Slushers increase tons per man shift and simplify muck-handling procedures

matically into a bucket which travels on an overhead trackway.

In the field of mine ventilation, control of dust and provision of an atmosphere in which men can work efficiently are more important than ever. Recently plans were announced for a heating plant at another property on the iron range to temper the cold winter air entering the mine. Natural refrigeration has been put to use at Noranda. The air is warmed in winter by passage through fine sprays of water in a large open stope. The heat exchange effected in freezing the water results in warming the air so that a normal volume can be passed through the mine even in periods of bitter cold weather. The thousands of tons of ice produced during the winter months by this operation are then used to cool the ventilating air in summer.

Mobile Plant Facilitates Examination

Mobile equipment, developed to such a high extent for war use, has been applied to prospecting and development. During the war the Nova Scotia Department of Mines undertook examination of old mine workings in the search for strategic minerals. A mobile mining plant was assembled with complete equipment for unwatering mines, repairing shafts, sampling old workings, bulk sampling of shipments and for carrying on development work. A bulldozer, diesel power units, compressor, sectionalized portable buildings, shop equipment, rock drills, a mechanical loader, mine cars, track and pumps are included in the outfit. The entire plant can be moved on a moment's notice, in circus style. In one case, where a 260-ft shaft and adjacent workings were to be unwatered for examination, pumping began 12 hr after the equipment arrived at the job and unwatering was completed in 133 hr.

Changed Methods Create New Ore Reserves

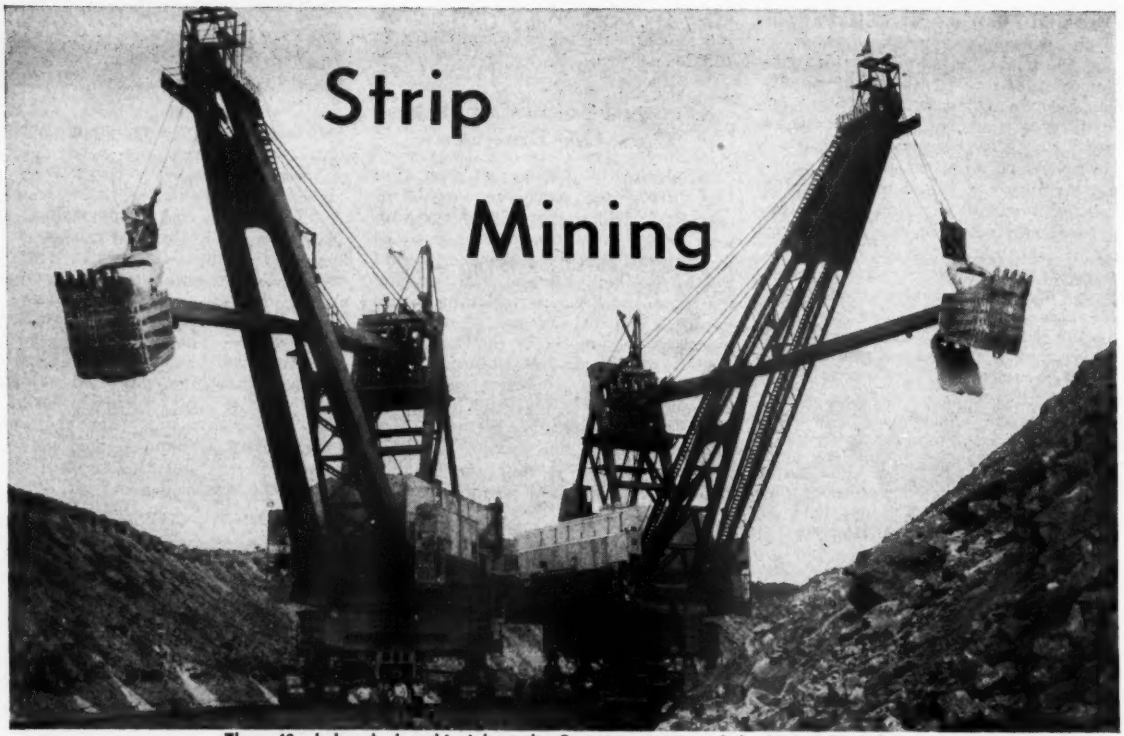
No review of developments in mining during the past year would be complete without mention of the radical change in mining methods noted in the plans that have been announced by the Bunker Hill and Sullivan and the Anaconda Copper Mining Companies. The introduction of undercut block caving methods in the Coeur d'Alene and Butte districts brings into the ore-reserve classification many millions of tons of material that were unmineable by selective methods. The application of block caving in these districts results in important additions to our national mineral wealth and is one of the significant developments of the year.

In conclusion, the importance of mechanization and the importance of following up and supervising the utilization of mechanical equipment to insure its efficient application can hardly be over-emphasized. The manpower problem makes it imperative to work fast with as small a labor force as possible. The best answer to today's mounting costs is a combination of mechanization, organized supervision and mining methods designed with the realization that the basic principle of economical underground mining is to "get the ore out fast, before the weight comes."

Heavy equipment moves large tonnage in open-stope mining

Cable cutter at underground iron mine is mounted on slusher for safety and convenience

Strip Mining



These 40-yd shovels do a big job at the Georgetown mine of the Hanna Coal Co.

Under the Stimulus of Efficient, Low-cost production with Large Capacity Equipment, Open-pit Coal Operations Continue to Grow

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By THOMAS C. CHEASLEY
Sinclair Coal Co.

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DUE to several reasons the surface or strip mining of coal has increased sharply in the past three decades. Two world wars required maximum total outputs; gave an impetus to the establishment of new mines using this method of recovery, and brought new equipment and new production companies into the industry. Many of these continued in coal production at wars' end even though they may have followed other lines previously.

Undoubtedly, the advent of especially designed excavating equipment in sizes adequate to handle ever-increasing overburden depths was responsible, to a large extent, for the great tonnages produced by strip mining. The fact that coal-strip companies recognized the necessity of quality production and installed modern tipples with mechanical cleaning facilities, thermal drying, etc., made possible the universal acceptance of their product.

Other factors responsible for continued increased strip coal production are:

(1) The fact that strip mining is highly efficient—a high percentage of coal, in place, is recovered.
(2) Most strip-mined coal could not be recovered otherwise.
(3) High tonnage per man per day results because of almost complete mechanization.

Strip Coal Production

The best available figures indicate the strip tonnage outputs over several years by way of comparison:

1924	13,543,200 Tons	2.8% of Total
1937	34,817,000 Tons	7.0 of Total
1942	67,202,663 Tons	11.5 of Total
1946	119,065,755 Tons	20.0 of Total
1947	128,000,000 Tons	*21.0 of Total
1948 (est.)	135,000,000 Tons	*22.0 of Total

* Estimated, and assuming same number of operating days per year.

There has been a geographic change in the locale of strip-coal loadings. Some states have joined the strip-state group with considerable regional tonnage being shipped from new areas. How long they will remain factors in the strip-tonnage picture is not known, but any decline will undoubtedly be offset by increased tonnage shipments from the older established stripping states so that the annual strip tonnage should increase until some major change in markets causes a change in presently-projected production plans.

One example of rapidly increasing state strip output is the record of Pennsylvania bituminous production. In 1942 that Commonwealth produced by stripping a little less than 10,000,000 tons of bituminous coal. In 1946 over 31,000,000 tons were thus produced with a ratio of strip to deep mine production of 1:3, and indications for 1947 show more than 32,000,000 tons of probable production. The month of Oct. 1947 showed production in that state of over 3,000,000 tons of strip bituminous coal.

Stripped anthracite in Pennsylvania seems to hold fairly uniformly at 10,000,000-12,000,000 tons and perhaps will continue to do so.

In west Kentucky a similar large increase in strip production took place.

In 1936 only 32,000 tons were stripped, which was 0.1 per cent of the state's production. In 1942, however, Kentucky stripped 1,436,160 tons, which was 2.3 per cent of the state's total. And in 1946 there was stripped 7,300,000 tons, or 10.9 per cent of Kentucky's total production.

Civil Engineering

Properly mapping areas to be stripped has progressively become important and more thoroughly handled. Although some operators in the old days did their prospecting with the strip shovel, the vast majority of strip coal operators today employ sizeable organizations to define minutely the outcrop and extent of the seams. Spacing of prospect holes has been consistently reduced, and test pits are dug in many instances to check engineers' reports.

Drainage is well-calculated in advance, and, if the report of the Land Use Advisory Committee is followed, the ultimate reclamation of stripped areas will be well-considered before the big shovel starts its work.

Drilling and Shooting Practice Improves

Drilling tools have kept pace with other strip-mining equipment both as to size and efficiency. Large churn drills, resembling oil-well, cable-tool equipment, are in use to a large extent, especially where rock has to be penetrated preparatory to shooting, but new, larger rotary drills are in use in at least three fairly large operations in Illinois and Kentucky.

Where satisfactory blasting can be had by horizontal drilling from the pit, it seems this would continue to be the most economical procedure. A new giant air-drill and a newly-patented type of jackhammer reported within the last year or two, may, if they become realities, reduce drilling costs considerably.

No comparison exists between the old "wagon" drill and the new "truck" drill or tractor unit. Multiple drilling units are being installed on self-propelled chassis to increase footage, reduce move-up time, and to radically change the ratio of "work" to "dead" time in operation.

Types of explosives used still vary with local opinion and there does not appear any distinct trend away from any of the recognized methods in use in the past decade.

Stripping

With larger excavating equipment becoming available the ratio of overburden to coal-seam thickness continues to increase. Multiple units such as dragline-shovel combinations are coming into greater use. A decided increase in the use of scraper-loader buggies has been noted, not only in relatively small operations, but also as auxiliary equipment in some of the larger mines.

Churn drills prepare a bench for blasting

Only a relatively short time ago a world's record was set with a 33-yd shovel, excavating 1,000,000 cu yd of over-burden in one month. Nowadays that yardage per month is commonplace in many larger operations.

Coal Loading

Similar trends as to size have followed the use of loading units. Just before World War II a loading dipper of 5-6 yd capacity was noteworthy. During the wartime demand for maximum output, loaders of 7¼ yd capacity were considered standard by the larger operators. On order now with the two larger shovel companies are several units with 10 yd buckets. The shortened work-day and work-week trend will no doubt have an important effect on the operators' thinking when new loading equipment is purchased.

Equipment Production Summary

Due to war conditions, a year by year comparison of shipments of stripping and loading equipment in recent years would have little meaning. It is safe to assume that nearly all excavating units delivered in the past 10 years are still in service, and units delivered in 1947 and now on order, represent new tonnage requirements.

Recent major improvements aside from increased size, cover better materials, amplidyne control, and electric motor replacement of friction clutches on shovels of the sizes usually used for coal loading. Improved design in various mechanical units is noteworthy.

Increased size of all units on order seems to average approximately 10 per cent, with certain items running up to 20 per cent. An example is the 30 cu yd dragline bucket, with a boom length of 200 ft, a remarkable increase in range as well as capacity.

From the best, but incomplete, information available it appears that between 45 and 50 units for stripping and loading, with a capacity of 5 yds or more, were shipped to users in this country in 1947. It is estimated that these figures will be exceeded in 1948 by about 10 per cent.

Orders on hand, in all categories, show equipment plant capacity sold out for from two to five years. The figures on smaller unit production is not available.

Tire-mounted Equipment Serves Most Strip Mines

In the late 1920's a radical change in the method of hauling coal from pit to tipple took place. In the Middle West some five-ton semi-trailers were hauled by small truck-tractors over improvised roads with such success that automotive haulage has almost monopolized this coal movement.

As larger tractors came into use with better road building, the trailer size increased to 7 tons, then to 10 tons and on to 15, 20, 25 and up to 80 tons. Custom-built, heavy-duty tractors became necessary and were developed as required. Fuel used is usually gasoline, butane, or diesel

Quantity and quality in a Missouri strip mine

fuel, and trailer sizes in the majority run from 25 to 35 tons.

The grades on haulage roads were practically ignored with amply-powered tractors, whereas, with rail haulage, the ruling grade had to be held to a minimum.

Many other advantages of automotive haulage soon became evident, such as the easy and frequent coverage of the mining operations by officials, the speed-up of repair operations by use of mobile equipment, and the quick evacuation of sick or disabled personnel. It is customary in the strip industry to find carefully-engineered, well-built, well-maintained highways on which to move high tonnages at good speeds with low per-mile and per-ton costs. It appears that the present developed sizes will be adequate.

More Tonnage Handled by Preparation Plants

No doubt necessity was responsible for the installation of modern preparation plants at strip mines. When deep-mined coal was hand loaded and strip coal by shovel, it soon became evident that something better than the hand picking table would be required to prepare strip coal to the users' satisfaction in competitive markets. As a result, a surge of orders for new preparation plants with mechanical cleaning or washing facilities to be followed soon after with thermal dryers, was generated in the Midwest states.

Today some of the most modern and largest plants are on strip mine property doing a job second to none, and a huge back-log of orders for modern high-capacity plants is in evidence, with all of 1948 shop capacity already purchased in many cases.

The ability to secure steel and other materials for fabrication is now, and apparently will continue for some time to be the chief bottleneck in production.

There is a definite trend towards mechanical cleaning, with emphasis on the finer sizes. Thermal drying is also on the increase, with the largest tons-per-hour total ever built on order or currently being delivered.

Utilization

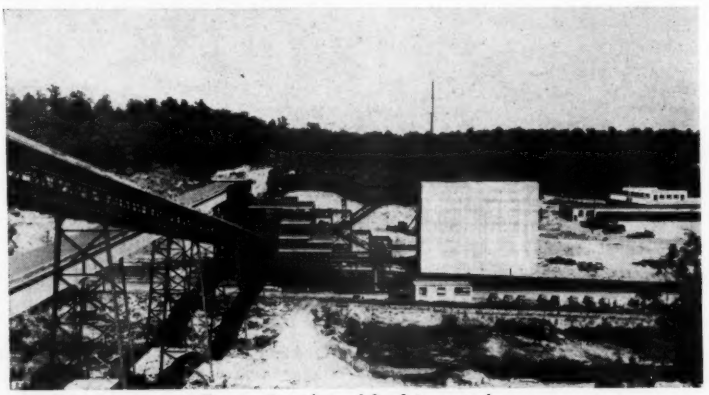
Well-prepared, strip-mined coal has been successfully promoted as attested to by universal use. In many instances the same seam of coal is mined by both common methods, and acceptance of strip-mined coal on an equal basis is expected. The uniformity of preparation, from car to car and from day to day, is largely responsible for this condition.

Where coal is being gouged from outcrops by those with no interest in the future of coal, and loaded as so-called "Mine Run," the consumer invariably complains, and as a result, the whole coal-stripping industry is classed as sub-par by many. The better strip operators have done much to improve the sale and acceptance of well-prepared strip coal by sending combustion engineers, who are also public relations men, out into the field, where, by personal contact they have built up confidence and paved the way for continuing shipments.

Reclamation

There are many in and out of the coal industry who are ill-informed as to the uses to which the strip banks are being put after removal of coal. Some strip coal operators who have done an excellent job of production, preparation and sales have shown little or no interest in strip-bank reclamation or utilization.

It has been proven in innumerable instances that the strip banks are assets rather than liabilities, and as a result of cooperative studies and experiments being carried on by the strip-coal operators and their reclamation organizations, with the U. S. Forest Service and state agricultural authorities, many problems are being solved, and much is being accomplished. The National Coal Assn. has a Land Use Committee, appointed specifically to expedite this work, and its Land Use Committee makes frequent field trips to the various states called stripping states to advise on best reclamation efforts.



Preparation planned for future needs

One of the things which has been definitely proven is the fact that the "deep plowing" brings to the surface, in usable state, the minerals, chemicals, and trace elements, which are so essential to growth and nutrition in trees, grasses, and legumes.

If the banks are left as deposited by the stripping units, a porous seed bed is the rule and any attempt to disturb the banks by leveling or partial leveling is definitely detrimental from practically every standpoint.

The porous banks accept and retain moisture, and the ridges, if undisturbed, are "big brothers" to the smaller ridges built by terracing and/or contour plowing, and recommended by agricultural and conservation authorities to prevent erosion.

The following tabulation shows some of the activities, but one of the intangibles is the fact that highly-bred animals are used for breeding stock in many instances where grazing is promoted rather than trees.

Trees, usually as seedlings, are more often purchased from state nurseries and the totals shown below reflect only the number of trees *available.* Many, many more would be planted each year if state nurseries were able to fill orders.

cover provided for wild life has tremendously increased the game population in areas surrounding and including the strip pits.

Fur-bearing animals are becoming increasingly more numerous in practically all strip areas, and fox, wolf, coyote, rabbits and muskrat, beaver, frogs, and other amphibians in sizable populations are not uncommon.

Feed for quail, prairie chicken, ducks, geese, and other feathered denizens of these recreation areas, has been planted especially for their encouragement, and, as a rule the strip-pit areas provide the best hunting, of the above mentioned types, in any state where stripping is carried on.

State	No. trees Planted Before 1947	No. trees in 1947	Est. No. trees for 1948	Acres Seeded Before 1947	Acres Seeded In 1947	Acres Seeded Estimated In 1948
Illinois	10,576,000	479,000	450,000	6,965	5,267	2,000
West Virginia	?	?	?	?	?	?
Ohio	4,460,175	1,154,875	1,250,000	2,175	1,092	1,000+
Missouri	270,000	20,000	80,000	400	300	2,000
Oklahoma	?	5,000	20,000	.....	.....	500
Kansas	.....	.....	20,000	.....	.....	.....
Pennsylvania	1,500,000	500,000	1,000,000	50	50	100
Indiana	18,671,300	2,464,400	1,434,500	314	241	425
	35,477,475	4,623,275	4,254,500	9,904	6,950	6,025

Above figures are from reports of organized groups, members of National Coal Association Land Use Advisory Committee. Perhaps 10 per cent additional plantings not reported.

In addition to trees and grasses, hundreds of thousands of fish have been "planted" in the pits, which now provide the finest local fishing holes. Bass and other game fish thrive in these waters, which are fertilized according to the best recommended practice, in many instances. Also, the

The Future of Coal Stripping

Although many think only of the larger operators when discussing the Coal Strip Industry, nevertheless, definite consideration must be given the smaller operators who make coal stripping their career. Usually the men in this latter category are awake to the necessity of producing a quality product of uniform grade and continuously do a good job.

While the industry is in a seller's market, however, the average quality of its product declines, as is true in most other industries. The factor causing most serious complaints is shipment by so-called "snow birds" of inferior material, produced without regard to quality, and without any preparation to up-grade it. In some areas the result is to have all strip-mined coal referred to as an inferior product.

To overcome this unfavorable publicity it appears that all strip operators who expect to stay in this industry must do more than ever before to produce and ship the highest quality product they are capable of shipping.

Fortunately, most operators are now in position to place orders for needed equipment to attain this end. Even though deliveries of purchased equipment may be slow, it is probable that they will be delivered and put in operation before it is too late.

The stripping picture has changed in the past three decades from the small shovel or horse-drawn scraper with only a loading ramp at best for "preparation," to one where long-range planning is required, especially concerning coal reserves. The investment in a modern strip mine runs into many millions of dollars, but the industry is fortunate in that the leaders not only know the problems but have the answers, in most cases, already at hand to progress. With this sort of leadership it seems that the future of the coal stripping industry must be bright, even though some barriers have to be hurdled.

Good fishing in a Kansas strip-pit pond

Water sprays allay dust to improve working conditions

Mine Safety

Safe Mining Means Constant Vigilance as Falls of Roof and Coal Exact High Toll

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By J. K. RICHARDSON
Manager
Utah Mining Association

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CERTAINLY, the problem posed an individual in projecting what will happen, from a safety standpoint, in an industry as fraught with possibilities as our own, is one calling for a crystal ball. This is particularly true as, from a statistical standpoint, only fragmentary data exist at this time.

There have been many occurrences in our industry, during 1947, which are not subject to speculation. The full impact of some of these happenings may not be felt until 1948 but it is well to review the actual situation.

It is easiest to review the accident picture in the coal industry for relatively complete and accessible records are maintained currently. Incidentally, the maintenance of accurate, current accident data in the coal industry is an activity which might well be emulated by all branches of the industry. These records may serve the coal industry well during anticipated future congressional discussions of Federal Safety Codes.

In 1946, the coal mine fatality rate was 1.64 persons killed per million tons of coal produced; the lowest rate in the history of the industry. The tentative rate for 1947 is approximately 1.72, or somewhat higher than 1946 though it still is the second best rate in the history of the industry. This will be the first time since 1942 that the accident rate in coal mines has evidenced an upward trend. The year 1947 had six months of Federal administration of bituminous mines and in that period there were two major disasters with 119 deaths. Two disasters in anthracite mines, in the same period, killed 25 employes.

The calendar year of 1947, at the time of this writing, has had six major coal mine disasters with 179 deaths as follows:

(1) January 15, 1947, Nottingham (anthracite, Pennsylvania), 15 killed.
(2) March 25, 1947, Centralia No. 5 (bituminous, Illinois), 111 killed.
(3) April 10, 1947, Schooley (anthracite, Pennsylvania), 10 killed.
(4) April 30, 1947, Spring Hill (bituminous, Indiana), eight killed.
(5) July 24, 1947, Old Ben No. 8 (bituminous, Illinois), 27 killed.
(6) December 11, 1947, Franklin (anthracite, Pennsylvania), eight killed.

The above is in sharp contrast to 1946 with its two major disasters and 27 deaths and the fiscal year June 30, 1938-July 1, 1939, where there were no major coal mine disasters. Despite the headlines generated by disasters, "falls of roof and coal," as an accident cause, continue to take the higher annual toll.

A pertinent 1947 development in coal mine safety is the fact that the agreement between the bituminous coal miners and the operators, for the first time in the history of the negotiations, had specific requirements as to safety. An unfortunate commentary is the fact that these requirements placed little or no responsibility upon the UMWA or its membership for accident prevention. As usual the implication was to place the entire responsibility for accident prevention upon the mine operator, entirely eliminating the most potent cause—the human factor.

Action Taken Under Code

The report by Admiral Boone, relative to the medical and welfare conditions at and around bituminous coal mines, has been published and is available from the Superintendent of Documents, Washington, D. C. Also of much interest is the report submitted

to Secretary of the Interior J. A. Krug, covering the operation of the "Federal Mine Safety Code for Bituminous Coal and Lignite Mines of the United States" during the period July 29, 1946, to June 30, 1947, by Capt. N. H. Collisson. This report points out that the Coal Mines Administration or the Bureau of Mines during that period closed 627 mines for safety violations, most of which were permitted to reopen after compliance with the provisions of the Code.

It is anticipated that the trend toword greater coal-mine mechanization is continuing and will contribute to fewer accidents. Rock dusting in over 1100 mines was brought up to Code standards. Within this 1100 figure were 399 mines which had previously not practiced "rock dusting." This advance, if kept in effect, should contribute to a lower death toll, as should the introduction of permissible explosives in 199 mines previously using black powder.

No major disasters in connection with fires occurred in metal mines in 1947. This is mentioned primarily due to the fact that this was one of the greatest causes of metal-mine fatalities 25 or more years ago. However, it should not be thought that the hazard no longer exists, for such thinking is fallacious. A fire at the Malartic mine, in Quebec, cost 12 lives. That U. S. metal mines have not suffered such a disaster is largely due to improved safety techniques and management attitudes with respect to such hazards.

Hoist-rope Studies Conducted

Much work is being done by Canada on hoist-rope safety research. There have been some fatalities from hoist-rope failure in Canada. Again the U. S. missed this particular type of accident in 1947 but we feel that only the exercise of constant vigilance will maintain this clean record. We can reasonably expect some excellent data on hoisting-rope inspection to come from the Canadian studies and U. S. operators should make full use of this information when it becomes available.

Preliminary estimates indicate that the accident rate in metal mines will probably be somewhat higher than in 1946. This is largely attributed to the increased activity in the ferrous and nonferrous mines due to demand for these commodities. All mines are suffering or have suffered from personnel problems, not the least of which has been a high turnover rate. This rate of turnover does not permit proper training of employes for underground work.

Nonmetallic mines are expected in general to show a decrease in accident rate in 1947 from the 1946 figure.

The Joseph A. Holmes Safety Association, at its 1947 annual meeting, gave 125 awards for meritorious safety achievements: 37 awards went to coal mining; 31 to metal mining; 33 to the petroleum industry; 5 to quarries; 4 to nonmetal mining; and 15 to individuals. A special medal award was made to A. J. R. Curtis, of the Portland Cement Association, for "outstanding leadership in connection with the remarkable safety record maintained more than 25 years by approximately 125 member plants of the Portland Cement Association. Largely as a result of his continuous efforts, more than 70 of the plants have operated for a calendar year or more without a lost-time accident, and at least 21 have been accident-free for more than 2000 days."

Industrial Hygiene in Metal Mining

A tendency is noted among small metal mining operations in the West to take cognizance of health hazards. One group, operating in Utah, has engaged the services of F. F. Netzeband, formerly of the Tri-State District, to assist in the development and consummation of an industrial hygiene program. It is to be hoped that a similar "pooling of resources" will take place in other districts, with activities extended into accident prevention work; this has been done to some extent at Butte, Mont., where recently a mine accident prevention organization was formulated somewhat similar to the accident prevention organization that has functioned with much success over many years in the Lake Superior mining region.

The safety effort of the mining industry, in the opinion of the writer, is due to suffer much from the anticipated loss, by the Bureau of Mines, of Dan Harrington, Chief of the Health and Safety Branch. Mr. Harrington announced the fact that he will retire in 1948. This man has probably done more to advance mining safety than any other single individual. He is recognized, and respected, as the able and fearless leader of the mining accident prevention movement. The standards of impartiality and "square dealing" set by Mr. Harrington are exacting and will necessitate great care in the selection of his successor by the Bureau of Mines.

During 1947, Dr. R. R. Sayers retired as Director of the U. S. Bureau of Mines and is, at present, actively charged with the administration of the welfare program set up by the UMWA. Dr. Sayers' successor, James Boyd, formerly dean of the Colorado School of Mines, is at present serving under an interim appointment in that his selection has not been confirmed by the U. S. Senate. The appointment of Dr. Boyd has been strongly opposed on the grounds that he is unfamiliar with some of the details of coal mine safety procedures, but this opposition has apparently overlooked the fact that the work of the Bureau of Mines is far reaching in all technical aspects of our industry. The mining industry approves the appointment of Dr. Boyd, realizing that his qualities as an administrator and technician far overshadow any of the shortcomings charged. Safety men are disheartened in recognizing the wolf of political skulduggery camouflaged in the cloak of "safety." The majority feel that Dr. Boyd has a pool of well-qualified men in the Bureau from which a competent coal safety man could be selected to handle this phase of the Bureau's activities.

Constant examination and inspection promote safe practice

It is felt that at this time a word of warning would not be amiss in connection with a general summary of safety activities. A further effort may be made during the coming session of Congress to incorporate within the Federal Coal Mine Safety Code "police power" provisions for the Bureau of Mines. The attempt may even be made to extend such powers to the entire mining industry and all members of the industry should be on the alert to prevent the enactment of a measure of this type. Thinking individuals, both within and outside of the mining industry, are unequivocally opposed to such legislation.

Safety Provisions Must Fit Conditions

After many years in accident prevention work, it is apparent that no single set of rules can or will work in all mines all over the country. Methods, even between mines within a district, vary and this flexibility must remain if existing physical conditions are to be successfully and safely met. Nor is it desirable to take away from alert management and employes the initiative in safety that is evidenced by the material decrease in accident rates since the safety movement became a recognized part of managerial thinking. Experienced members of the Bureau of Mines recognize the task and the improbability of obtaining competent and experienced safety engineers, as their representatives, in whom such contemplated enforcement responsibilities can safely be placed. Already, under the present code, competent engineers and inspectors are spending a major portion of their time in attempting to determine whether or not, legally, certain circumstances or conditions are or are not in violation. This means that bona-fide accident prevention activities are being subjugated to pseudo-legal pondering. The inspection codes of many states are considered to be far superior to the legal monstrosity born in a place far removed from the practical operation of the mining industry.

In general, the safety record of 1947 in mining will show some deterioration. Intelligent reasoning, however, will bear out the fact that many unusual conditions have existed which have been foreign to the experience of all of us. An influx into mining of young men, into whom a spirit of recklessness has been trained in war service, is one factor; these men are restless and seldom stay long enough for adequate training. The impelling urgency for the minerals so necessary to meet the demands of a war-torn world have opened new vistas and posed unfamiliar problems to all of us. Experience gained in 1947 should stand us in good stead in 1948 if we refuse to subjugate individual initiative and freedom to the carping criticisms of irresponsible but vociferous parties.

Past Progress and Future Aims In Mineral Dressing

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By GEORGE H. ROSEVEARE
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New Ideas are Being Carried Out to Offset Rising Costs and Expand Ore Reserves

A COMPARISON of large-scale milling operations in the Southwest for the periods of the two World Wars, 1914-18 and 1939-43 shows that 87 per cent more copper ore was mined in the latter period to produce an equal amount of copper. This comparison shows a marked reduction in the metal content of mill heads over a period of 29 years. The trend in decrease of mill heads was not entirely due to the non-availability of higher grade ores but to a large extent to advances in the technology of mining, concentrating, and smelting practices which made the handling of progressively lower grade ores profitable. The cut-off, after mining, between ore and waste at one large southwestern concentrator during the late war was 0.40 per cent copper during a difficult operating period and with copper selling at 12c per lb. From the long-range viewpoint further reductions in the metal content of permissible mill heads for copper and other ores will undoubtedly be made but such reductions will require further substantial improvements in operation and new information resulting from metallurgical research as the amount of recoverable metal decreases per ton of ore.

Cost Cutting Increases Ore Reserves

Although the long-range trend with respect to future progress in mineral dressing has been mentioned, the immediate problem is to compensate, at least to some extent for the increased costs of wages, supplies, and power and it is this problem that is receiving the concentrated attention of operators.

Among the steps which have been taken to reduce operating costs may be mentioned the remodeling of existing plants and more attention in the design of new plants to effect lower operating costs even at considerable increase in capital expenditures, changes in routine operation by employing more mechanical devices as a substitute for manpower, the use of automatic controls to gain plant capacity or to improve the metallurgy by more uniform operating conditions, and savings in smelting costs by producing more desirable concentrates. The examples which follow show some of the changes which have been made or changes which are planned to accomplish savings in operating costs.

The new crushing plant of the Magma Copper Co. is designed so that the primary and secondary crushing operations are placed close together on one floor in order to reduce operating attention to a minimum.

A metallurgical plant in the Southwest has reduced the operating crew from 350 to 200 men by adding labor-saving devices such as trucks and cranes and by reducing the amount of sampling, inspection, and other routine work.

Consideration is now being given to the installation of a sink-float plant to rough concentrate fluorite at

a mine in New Mexico. The mine is 70 miles from the flotation plant now treating this and other ores. The rough concentration by sink-float at the mine followed by a finishing operation at the flotation plant is expected to cut the transportation cost in half and also result in improved metallurgy at the flotation plant.

A capital expenditure for a lime plant at one of the southwestern concentrators has resulted in savings. The lime was formerly purchased from different companies and often the grade was poor and deliveries unsatisfactory. A modern lime plant recently put into operation at the concentrator is producing a higher grade product at less cost.

Automatic devices for the control of alkalinity, promoter reagents, pulp density, and froth have received attention in recent reviews of mineral dressing. Objects are to improve the metallurgy by more uniform operating conditions, to reduce reagent costs, or to gain grinding capacity by regulating the rate of feed to the grindability of the ore rather than feeding at a more or less uniform rate irrespective of grindability. The Castle Dome mill uses such a control in the grinding circuit. The control device maintains a relatively constant-return sand feed from the classifier to the grinding mill. If the character of the ore changes and grindability increases or decreases the control equipment accordingly varies the rate of feed to the ball mill. The density of the pulp in the classifier pool is maintained more or less constant by a separate Massco density controller. The use of this automatic control has resulted in increased grinding capacity at Castle Dome of 3 to 5 per cent.

There is an increase in the practice of rationing balls in grinding and this practice is resulting in an increased grinding capacity at some plants. Investigation of ball rationing is continuing at the Morenci mill and although the test program is not completed it appears that charging a 10 by 10 ft mill with 25 and 75 per cents of 3-in and 2-in balls, respectively, resulted in an increase of 70 to 100 tons capacity per day and also in a better ground product as compared to the use of only 3-in balls.

Improving Grade of Concentrates

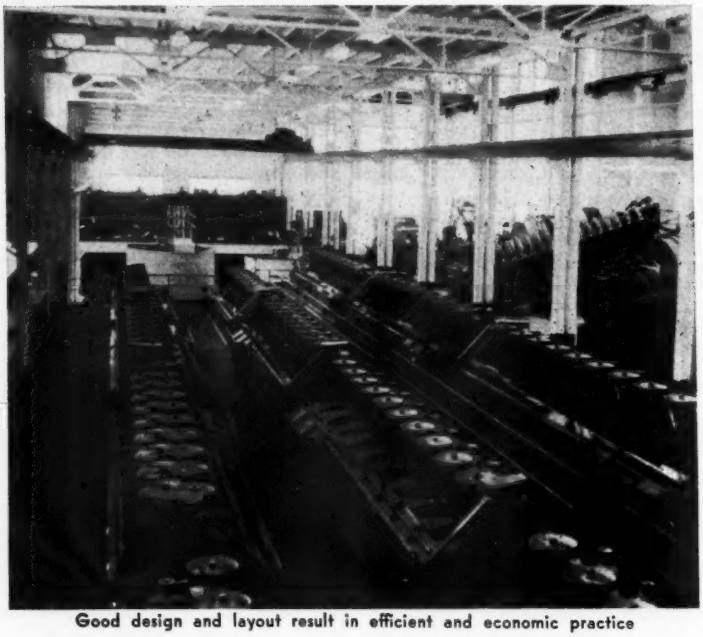
Reduction in operating costs by a cooperative effort between the concentrator and the smelter personnel is now a new procedure in copper operations as such cooperation has been standard practice since the introduction of the raw charge in smelting, especially if concentrator and smelter are under the same management. In line, however, with the current necessity for reducing costs, the production of more desirable concentrates is not only receiving further attention in the treatment of copper ores but also in the concentrating of other ores.

An interesting example of this cooperative effort and the improved results obtained occurred recently at a southwestern concentrator. A substantial decrease in the silica content of the concentrate was desired by the smelter and laboratory tests indicated that the decrease could be effected at the expense of approximately three per cent in extraction. From the economic standpoint the decrease in silica was more important than the loss in recovery and the concentrator changed its flowsheet to allow regrinding and cleaning by flotation, to make the desired product. Not only was the desired concentrate produced but the anticipated loss in extraction did not occur. In fact, an increase in the overall mill extraction was made with the new flowsheet.

Experimental work at the Magma concentrator, to obtain data to be used in the design of a new plant, shows that classification of the rougher flotation concentrate followed by the regrinding of the coarser portion and the cleaning of the combined reground and fine rougher concentrate will permit the elimination of roasters and the use of the raw charge in smelting. The new flowsheet as compared to former practice resulted in doubling the copper content of the concentrate, reducing the insoluble by one third, and improving the extraction.

The Eagle-Picher concentrator at Sahuarita, Ariz., is investigating the regrinding of zinc middlings to reduce transporting and smelting costs

Automatic controls enable three men per shift to operate the 1200-ton mill of Tennessee Copper Co.



Good design and layout result in efficient and economic practice

and results indicate an improved grade of zinc concentrate and some increase in the recovery of zinc and lead will be obtained.

In the treatment of copper-lead-zinc ores the practice of separating the copper and lead sulphides from the bulk concentrate is increasing. There are three general methods in use, each with modifications, for making this separation as follows: Depression of the galena with sodium dichromate while floating copper sulphides, depression of galena with sulphur dioxide with flotation of copper sulphides and depression of chalcopyrite by cyanide with flotation of galena. The selection of a method for the separation of lead and copper depends upon the relative quantities of the two sulphides in the concentrate, the condition of the surface to be floated, the amount of zinc present, the smelter contracts, and other characteristics of the specific ore treated. The latest separation to be reported is that at the Idarado concentrator where a satisfactory separation is made with cyanide and sodium sulphite of bulk concentrate containing over 40 per cent lead and less than 10 per cent copper.

At Tiger, Ariz., a flotation unit to treat oxidized lead ore was recently put into operation following experimental laboratory work the results of which indicated that satisfactory recovery and grade of concentrate could be expected. After several months of operation on ore derived from development headings which carried only 3 to 5 per cent lead, recoveries of 85, 80, 70 and 30 per cents lead, gold, silver and copper, respectively, are being made. Higher recoveries are expected when stoping commences and grade of ore improves. The present concentrate contains 50 per cent lead, 0.50 oz gold, 7.0 oz silver, and 2.0 per cent copper. The improvement over past results in the flotation of oxidized lead is believed to be due to the use of Reagent 425 added at the rate of two to three pounds per ton of ore. Recent work indicates that it may be desirable to replace half of Reagent 425 with an equal amount of sodium sulphide. The use of Reagent 425 is comparatively new in the flotation of oxidized lead minerals and its use indicates the production of a higher grade concentrate with reduction of silica content without the use of slime dispersants.

Carbon-cyanidation

In the separation of copper from lead at the Idarado concentrator, cyanide is employed to depress the copper and its use results in dissolving an appreciable amount of gold. The gold so dissolved is adsorbed by activated carbon added to the ore pulp. The carbon is recovered with the copper concentrate.

Considerable progress has been made on a pilot plant scale at the Getchell mine in removing adsorbed gold from activated carbon to determine the possibility of reusing the carbon without further activation.

Sulphur Dioxide Aids Flotation

The use of sulphur dioxide to assist the flotation of sulphides as reported by Lake Shore mines may find further application. Laboratory experimental work at Getchell indicates that its use results in increasing the speed of floating the sulphides of Getchell ore and improves the grade of concentrate.

Nonmetallics

Substantial progress continues to be made in the concentration of nonmetallic minerals, especially by flotation and heavy media methods. The number of minerals responding to concentration and the tonnages produced have been materially increased and further advances are to be expected in this active field. Commercial methods employ anionic collectors such as fatty acids, soaps, petroleum solphonates, and various wetting reagents. Alternative procedure of floating the siliceous gangue from the nonmetallic mineral to be recovered, employing cationic collectors, has given as good, if not superior results, on many separations, particularly those involving complex mixtures of silicate minerals.

Although commercially acceptable products can be recovered from many nonmetallic ores by the proper choice of the kind and quantity of reagents, not all ores are amenable to concentration by presently-known methods. The specifications as to purity and size of the acceptable products are becoming more stringent. Further research will be needed not only to perfect the separations to meet grade and yield requirements but to increase the number of nonmetallic minerals that can be handled by mineral dressing methods.

The development of nonmetallic operations in the Southwest and other localities similarly situated has suffered because of the transportation costs to eastern consumers and this situation has permitted only the higher grade materials favorably located to be profitably developed and mined. As industrial activity increases in the west the nonmetallic industry will become, it is believed, more important to the Southwest.

Concentration of Iron Ores

The change from the treatment of high- to low-grade ores which started in the copper industry in 1905 is now faced by other branches of the mineral industry and the problems involved will be largely in the field of mineral dressing.

One field of immediate interest is the concentration of low-grade iron ores which has been active in recent years on experimental and pilot plant scales involving specific gravity, flotation, and magnetic methods. Among the machines currently being tested on a pilot plant basis are the Dorrco Sizer, the Humphrey spiral, jigs, and magnetic concentrators. New methods of operation include the placing of a magnetic concentrator in the grinding circuit as developed by the Minne-

sota Mines Experiment Station. In sink and float methods, the Akins separator as a substitute for the usual cone and the McNeil selective media machine sponsored by the Stearns-Roger Mfg. Co. are being tested.

Despite recent advances that have been made in improving coarse gravity concentration of iron ores it is believed by many that the recovery of the fine iron oxides will be obligatory. The Jeffrey high-frequency jig and the McLaughton concentrator have been developed and tested for concentrating the finer sizes in several of the Mesabi Range plants and although the results were moderately satisfactory the capacities of these machines were low.

Concentration of fines by flotation of either the iron oxides or siliceous gangue is receiving particular attention as evidenced by the fact that more than a dozen iron ore flotation patents have been issued in the past several years and three of the large iron ore companies have been operating pilot plants for the past two seasons. The results appear controversial in that many believe that although flotation methods will make satisfactory extractions, the indicated cost is too high; on the other hand many believe that flotation will prove an economic accessory method for the recovery of finely divided iron oxides.

Although fine grinding and treatment of the entire ore by flotation is attractive from the standpoint of simplicity of flowsheet the employment of such practice must await the development of an inexpensive method of nodulizing or sintering of the fine concentrate. Recent information indicates that encouraging results are being obtained on a pilot-plant scale.

At the present time it would appear that the fundamental principle of good milling practice, namely to recover the iron oxide at the coarsest size compatible with producing the grade of concentrate required for smelting holds; therefore, flotation will if used serve as an accessory process to recover the fines resulting from crushing which remain in the tailing after gravity concentration.

Long-Range Potential Applications of Mineral Dressing to Petroleum

If the mineral dresser desires to take a longer range view of potential new applications of mineral dressing than that described for the concentration of iron ores the field of petroleum offers interesting possibilities. If published reports are correct, petroleum is another branch of the mineral industry which is producing faster than replenishing by new discoveries. In discussing this situation with a well-informed petroleum engineer it appears that mining and mineral dressing methods will possibly play some part at some future date in the production of petroleum. The known large tonnages of tar sands will possibly be mined by open-pit methods, the tar liberated from the sand by chemical means, and concentrated probably by flotation. Results of pilot-plant work in this field are now available and it is possible that the time for the development of such deposits is not too far in the future unless the synthesis of petroleum products from coal employing low-cost oxygen is so successful that other methods of producing petroleum products cannot compete. In the treatment of oil shales, improved mining methods are receiving attention, and crushing to produce minimum fines is also being considered. In the distant future it is possible that oil sands of shallow abandoned fields will be mined with the possibility of employing mineral dressing methods for the concentration of petroleum.

Mixed Copper Ore

Probably the most important unsolved metallurgical problem in treating copper porphyry ores is the so-called mixed ore problem. A low-cost method of recovering oxide copper minerals by flotation would be the most satisfactory solution. Much experimental work has been done and much work is in progress but little progress has been made. The difficulty is not in floating copper carbonates but in the recovery of copper oxides and silicates. Possibly the experimental and pilot-plant activity in the field of floating nonmetallic minerals will eventually bring forth reagents and methods for solving this difficult problem.

The second approach to the problem of extracting copper from mixed oxidized and sulphide ores is in the field of leaching, possibly combined with flotation. The first requirements for combined leaching and flotation are a low-cost solvent and a satisfactory low-cost precipitant. Experimental work to produce a low-cost solvent has been going on for years and some experimental progress has been made along new lines. Considerable attention is being currently given in pilot-plant work to produce a low-cost liquid oxygen and estimates of oxygen at a cost of a few dollars per ton have been recently published. If low-cost liquid oxygen becomes available, a new tool will be on hand for research in all fields of metallurgy and one highly important field will be the production of a low-cost solvent to treat mixed copper ores.

Nevada Operators Reelect President and Secretary

The Nevada Mine Operators Assn. elected officers at the 36th Annual Meeting held on Jan. 12, 1948. J. C. Kinnear was reelected president for the twenty-first consecutive time. Henry M. Rives was again chosen executive secretary and treasurer for his thirty-fourth term. Under their leadership the Association has established a remarkable record of achievement which has been of great benefit to the mining industry of Nevada.

Other officers elected for the present term were H. A. Johnson, first vice president and E. A. Julian, second vice president.

The executive committee of the association consists of the following: J. C. Kinnear, vice president, Kennecott Copper Corp.; H. A. Johnson, manager, Tonopah Mining Co. of Nevada; E. A. Julian, vice president, The Goldfield Consolidated Mines Co.; Chas. H. Segerstrom, president, Nevada-Massachusetts Co., Inc.; Percy G. Dobson, general manager, Summit King Mines, Ltd.; Cash I. Cook, general manager, Consolidated Coppermines Corp.; Geo. W. Mitchell, general manager, Eureka Corp., Ltd.; W. S. Larsh, general manager, Nevada Mines Div., Kennecott Copper Corp.; and R. A. Hardy, consulting engineer, Getchell Mine, Inc.

Inspiration Begins Stripping

Inspiration Consolidated Copper Co., Inspiration, Ariz., is stripping the overburden from that portion of its ore body which is to be mined by open-pit methods, and actual mining from the area is expected to start in March. When plans for the open-pit project were announced last year, P. D. I. Honeyman, general manager, stated that no increase in total tonnage treated by the company's leaching plant would result from the work, but that studies had indicated that the open-pit method would prove more economical for mining that particular area than the block-caving system heretofore employed throughout the operation. Ore will be trucked from the pit to a crushing plant, equipped with a 42-in gyratory, and then conveyed by belt to an ore bin at the end of a short railroad spur connection to the company's main shaft to the Live Oak line. Trucking from the pit will be handled by a fleet of nine Dart trucks, each capable of carrying a payload of 44,000 lb.

Coal Mine Equipment Sales*

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AND
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SHIPMENTS of mechanical loading equipment for underground use in coal mines in the United States, in terms of capacity, were 16 per cent less in 1947 than in 1946. The capacity of mechanical cleaning equipment sold for use at bituminous-coal mines was four per cent less in 1947 than in 1946.

Shipments of "mother" conveyors and shuttle cars increased 9 and 15 per cent, respectively, over 1946, in 1947.

This survey was made possible by the courteous cooperation of all known manufacturers of mechanical cleaning equipment for bituminous coal and manufacturers of mechanical loading and supplementary haulage equipment for use in all coal mines in the United States; data from various trade journals were also utilized.

Mechanical loading units and supplementary haulage equipment "sold in 1947" represent shipments made during 1947. Only a small percentage of the mechanical cleaning equipment sold in 1947 was placed in operation during the year; the balance will be installed in 1948 and 1949.

Mechanical Loading Attains Record High Application

Bituminous coal and lignite mechanically loaded in underground mines decreased from 262,512,729 tons in 1945 to 245,340,768 in 1946. However, the percentage of the total underground output so loaded increased from 56 in 1945 to 58 in 1946. Mechanical loading in Pennsylvania anthracite mines increased from 13,927,955 tons in 1945 to 15,619,162 in 1946; the percentage of the total underground output mechanically loaded increased from 40 to 41 during the same period.

Table 1 shows data on bituminous-coal and lignite production by methods of mining and mechanical cleaning for 1945-47, inclusive. Preliminary estimates for 1947 indicate that this was a record year for mechanical loading, strip mining and mechanical cleaning. The previous high record for mechanical loading and mechanical cleaning was in 1944.

Types of units sold—Table 2 shows the number of units of mechanical loading equipment sold to bituminous-coal, anthracite and lignite producers in the United States for use in underground mines for 1940-47, inclusive. Sales of mobile loaders and conveyors decreased 1.8 and 14.7 per cent, respectively, in 1947 from 1946, while the number of scraper units sold was 35 in each year.

Total sales by states—Table 3 shows the number of mechanical loading units shipped during 1947 to the various states. Types of equipment shipped are indicated by letter symbol in approximate order of capacity. For example, 187 mechanical loading units were shipped to Kentucky. Of this total number of units shipped, mobile loading machines (indicated by "L") furnished the largest addition to capacity, followed by conveyors ("C") and scrapers ("S"). Capacities are based on 1946 records of actual performance, as reported by mine operators. In 1947, 1343 mechanical loading units of all types were shipped to bituminous-coal and lignite mines, compared with 1331 in 1946—an increase of 12 units or approximately 1 per cent. The total number of units shipped to Pennsylvania anthracite mines decreased from 356 in 1946 to 165 in 1947, or 54 per cent.

Mechanical loading equipment exported in 1947, in terms of capacity, amounted to 19 per cent of the shipments made to mines in the United States. This is in comparison with 11 per cent exported in 1946.

Types of loading equipment sold compared with units in use—The trend in demand for various types of mechanical loading equipment is shown in table 4. At bituminous-coal and lignite mines three types of loading devices (mobile loaders, self-loading conveyors and hand-loaded con-

TABLE 1—BITUMINOUS COAL AND LIGNITE PRODUCTION BY METHODS OF MINING AND MECHANICAL CLEANING, IN THE UNITED STATES, 1945–1947, INCLUSIVE

	1945		1946		1947[1]	
	Thousands of net tons	Per cent of total	Thousands of net tons	Per cent of total	Thousands of net tons	Per cent of total
Surface stripping	109,987	19.0	112,964	21.2	135,000	21.8
Hand loaded underground	205,118	35.5	175,617	32.9	199,000	32.2
Mechanically loaded underground	262,512	45.5	245,341	45.9	285,000	46.0
Total production	577,617	100.0	533,922	100.0	619,000	100.0
Mechanically cleaned	147,886	25.6	138,670	26.0	160,000	25.8

[1] Preliminary.

TABLE 2—UNITS OF MECHANICAL LOADING EQUIPMENT SOLD TO BITUMINOUS COAL, ANTHRACITE, AND LIGNITE MINES FOR UNDERGROUND USE IN THE UNITED STATES, AS REPORTED BY MANUFACTURERS, 1940–47, INCLUSIVE

	1940	1941	1942	1943	1944	1945	1946	1947	Per cent change, 1947 from 1946
Type of equipment:									
Mobile loaders	233	368	352	234	286	359	495	486	− 1.8
Scrapers[1]	39	11	29	15	39	26	35	35	....
Conveyors[2]	1762	2130	1491	1100	708	861	1157	987	−14.7
Pit-car loaders	3	10	2	1	....	(3)	(3)	(3)	....
Total, all types	2037	2519	1874	1350	1033	1246	1687	1508	−10.6
Number of manufacturers reporting	32	32	28	24	22	25	24	23	....

[1] Reported as scrapers or scraper haulers and hoists.
[2] Includes hand-loaded conveyors and those equipped with duckbills or other self-loading heads. Sales of both loading heads and conveyors were counted for the years 1940 and 1941, but the figures for 1942–47, inclusive, do not include loading heads separately.
[3] Canvass of sales of pit-car loaders discontinued in 1945.

* Published by permission of the Director, Bureau of Mines, U. S. Department of the Interior.

TABLE 3—TOTAL NUMBER OF UNITS OF MECHANIZED LOADING EQUIPMENT SHIPPED FOR USE IN EACH STATE IN 1947

(L, Mobile loading machines; S, scrapers; C, conveyors)

State	Number of units of all types shipped in 1947	Types of equipment in approximate order of capacity
Bituminous and lignite mines:		
Alabama	87	L.C.
Arkansas	2	C.
Colorado	12	C.L.
Illinois	29	L.C.
Indiana	10	L.
Iowa	3	L.
Kentucky	187	L.C.S.
Maryland	4	C.L.
New Mexico	3	L.C.
North Dakota	1	L.
Ohio	58	L.C.
Pennsylvania	266	L.C.S.
Tennessee	34	L.C.
Utah	27	L.C.
Virginia	69	L.C.
West Virginia	546	L.C.S.
Wyoming	5	L.C.
Total bituminous and lignite	1343	L.C.S.
Pennsylvania anthracite mines	165	C.S.L.
Grand total	1508	L.C.S.

veyors) have shown tremendous gains in the number in active use from 1940 to 1946; the other two types (scrapers and pit-car loaders) have decreased during the same period. Shipments of mobile loaders to bituminous-coal and lignite mines decreased from 490 in 1946 to 485 in 1947, while scrapers increased from 3 to 12 and conveyor units increased from 838 to 846 during the same period. The total number of mechanical loading units of all types in use in Pennsylvania anthracite mines increased from 2736 in 1940 to 3824 in 1946, or 40 per cent, compared with an increase of 53 per cent at bituminous-coal and lignite mines for all types during the same period. Shipments of mobile loaders to Pennsylvania anthracite mines decreased from five in 1946 to one in 1947; scrapers decreased from 32 to 23; and conveyor units decreased from 319 to 141 during the same period.

Types of equipment purchased by states—Table 5 gives the number of mobile loaders, scrapers and conveyor units shipped into various states during 1947 and the number in use in 1946. West Virginia continued to receive the greatest number of mobile loaders, Pennsylvania, Kentucky and Ohio following in the order named. West Virginia also received the most conveyor units, followed by Pennsylvania, Kentucky and Alabama. Scrapers were shipped to three states in 1947; Pennsylvania anthracite mines received 23 units, Pennsylvania bituminous mines five, West Virginia, four, and Kentucky, three. Conveyor units shipped to Pennsylvania anthracite mines decreased from 319 in 1946 to 141 in 1947, or 56 per cent.

TABLE 4—SALES OF MECHANICAL LOADING EQUIPMENT IN 1947 COMPARED WITH TOTAL NUMBER OF MACHINES IN ACTIVE USE IN PRECEDING YEARS

	Number of machines in active use, as reported by mine operators							Number of machines sold, as reported by manufacturers in 1947
	1940	1941	1942	1943	1944	1945	1946	
Bituminous and lignite mines:								
Mobile loading machines	1720	1985	2301	2525	2737	2950	3200	485
Scrapers	116	109	93	83	87	87	75	12
Pit-car loaders	697	607	481	321	241	142	93	(1)
Conveyors equipped with duckbills or other self-loading heads	656	788	1062	1226	1331	1383	1521	(2)
Hand-loaded conveyors, number of units	2263	2807	3041	3191	3236	3385	3470	846
Anthracite mines (Pennsylvania):								
Mobile loading machines	(3)	(3)	(3)	5	12	20	27	1
Scrapers	[3]547	[3]505	[3]524	510	491	548	564	23
Pit-car loaders	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(1)
Conveyors equipped with duckbills or other self-loading heads	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(2)
Hand-loaded conveyors, number of units	2189[4]	[2]2432	[2]2491	[2]2701	[2]2807	[3]3006	[3]3233	141

[1] Canvass of sales of pit-car loaders discontinued in 1945.
[2] Sales of conveyors equipped with duckbills or other self-loading heads are included with hand-loaded conveyors.
[3] Mobile loading machines are included with scrapers.
[4] Pit-car loaders and conveyors equipped with duckbills or other self-loading heads are included with hand-loaded conveyors.

Supplementary Haulage Equipment More Extensively Used

"Mother" conveyors—For the purpose of this study, a "mother" or haulage conveyor is defined as a sectional, extensible, power-driven conveying unit that can handle over 500 ft of conveyor. Main-slope conveyors are excluded.

Sales of "mother" conveyors were included in this survey for the first time in 1945, with 142 sales reported. In 1946 sales increased to 187 and advanced further to 204 units in 1947. No capacity estimates have been made for these "mother" conveyors, and they are not included in the summaries of mechanical loading equipment.

TABLE 5—COMPARISON OF MECHANICAL LOADING EQUIPMENT AND "MOTHER" CONVEYORS IN ACTUAL USE IN 1946 WITH SALES REPORTED IN 1947, BY STATES

State	Mechanical loading equipment						"Mother" conveyors[2]
	Mobile loaders		Scrapers		Conveyors[1]		
	In use in 1946	Sales in 1947	In use in 1946	Sales in 1947	In use in 1946	Sales in 1947	Sales in 1947
Bituminous and lignite mines:							
Alabama	112	24	37	....	384	63	5
Arkansas	....	....	....	....	63	2	1
Colorado	30	1	1	....	283	11	1
Illinois	582	24	....	....	30	5	6
Indiana	146	10	....	....	....	....	8
Iowa	4	3	....	....	22	....	1
Kentucky	289	71	1	3	621	113	31
Maryland	1	1	....	....	43	3	....
Michigan	....	....	....	....	5	....	....
Montana	47	....	....	....	8	....	....
New Mexico	16	2	6	....	1	1	....
North Dakota	6	1	....	....	....	....	....
Ohio	162	28	....	....	166	30	23
Oklahoma	4	....	....	....	55	....	....
Oregon	....	....	....	....	2	....	....
Pennsylvania	693	93	17	5	893	168	26
Tennessee	11	8	....	....	168	26	5
Utah	80	10	....	....	117	17	....
Virginia	83	26	....	....	158	43	3
Washington	1	....	5	....	95	....	....
West Virginia	903	182	....	4	1564	360	90
Wyoming	30	1	8	....	313	4	....
Total bituminous and lignite	3200	485	75	12	4991	846	200
Pennsylvania anthracite mines	27	1	564	23	[3]3233	141	4
Grand total	3227	486	639	35	....	987	204

[1] Includes hand-loaded conveyors and conveyors equipped with duckbills or other self-loading heads.
[2] Includes all haulage conveyors with capacity over 500 feet except main slope conveyors. Data on number in use in 1946 are not available.
[3] Includes pit-car loaders and duckbills or other self-loading conveyors.

TABLE 6—NUMBER OF MOBILE LOADERS IN USE IN BITUMINOUS COAL AND LIGNITE MINES, BY TYPES OF LOADING, IN EACH STATE, IN 1945 AND 1946

State	Number of mobile loaders							
	Loading direct into mine cars		Loading onto conveyors		Loading into rubber-tired trucks		Total number in use	
	1945	1946	1945	1946	1945	1946	1945	1946
Alabama	27	24	51	58	25	30	103	112
Colorado	12	10	1	1	21	19	34	30
Illinois	454	453	26	28	90	101	570	582
Indiana	117	106	....	....	43	40	160	146
Iowa	....	....	3	4	....	....	3	4
Kentucky	143	156	9	10	85	123	237	289
Maryland	....	....	....	1	....	....	....	1
Montana (bit. and lig.)	45	43	....	....	4	4	49	47
New Mexico	10	12	....	....	2	4	12	16
North Dakota (lignite)	4	6	....	....	3	....	7	6
Ohio	115	117	31	17	28	28	174	162
Oklahoma	....	....	4	4	....	....	4	4
Pennsylvania (bituminous)	481	494	40	43	130	156	651	693
Tennessee	2	4	....	....	9	7	11	11
Utah	48	55	11	11	8	14	67	80
Virginia	71	73	2	3	5	7	78	83
Washington	1	1	....	....	....	....	1	1
West Virginia	625	689	17	27	122	187	764	903
Wyoming	21	24	....	....	4	6	25	30
Total	2176	2267	195	207	579	726	2950	3200

Trackless gathering equipment—Sales of shuttle cars or rubber-tired, self-powered haulage units increased 15 per cent in 1947 over 1946. Shipments were made to 12 states in 1947; West Virginia received the greatest number, followed by Kentucky, Pennsylvania and Alabama. During 1946, 25 per cent of the total bituminous coal and lignite loaded by mobile loaders was handled by shuttle cars and 4 per cent was loaded onto conveyors as the initial step in its transportation. The remainder of the mobile-loader tonnage (71 per cent) was loaded directly into mine cars.

Table 6 shows the number of mobile loaders in use in bituminous-coal and lignite mines, by states and types of loading, in 1945 and 1946. The total number of mobile loaders in use increased from 2950 in 1945 to 3200 in 1946, or 8 per cent, while the number loaded into rubber-tired trucks or shuttle cars increased from 579 to 726, or 25 per cent. Each mobile loader that employs shuttle cars requires one to three cars. Therefore, approximately 1500 shuttle cars were used in bituminous-coal and lignite mines in 1946.

Equipment for Mechanical Cleaning Sold in Nine States

Reports from 18 manufacturers of bituminous-coal-cleaning equipment show that sales were made in nine states in 1947. The total capacity of sales in 1947 was 17,300 net tons of cleaned coal per hour, as compared with 18,000 net tons capacity sold in 1946.

Table 7 shows data on bituminous coal cleaned in 1946, by type of equipment in use and annual capacity of equipment sold in 1947. For comparative purposes, the annual capacity of 1947 sales is based on the average number of days mines were active in 1946. However, only a small percentage of the cleaning equipment sold in 1947 was placed in operation during the year; the balance will be installed in 1948 and 1949.

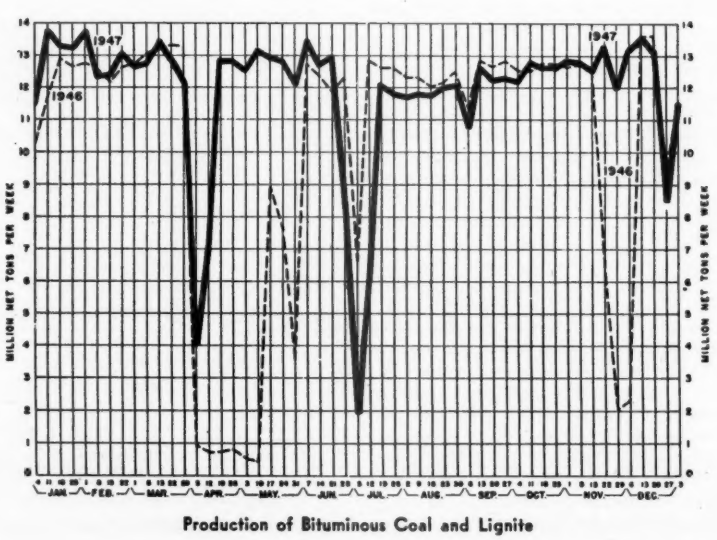
The capacity of all types of equipment sold in 1947 for cleaning coal by wet methods comprised 24 per cent of the bituminous coal cleaned by wet methods in 1946, while the capacity of pneumatic equipment sold in 1947 was 6 per cent of the tonnage cleaned by pneumatic methods in 1946.

In terms of capacity, the ratio of sales of new cleaning plants to additions or replacements of present plants remained the same in 1947 as 1946, or two-thirds as new plants and one-third as additions or replacements.

TABLE 7—BITUMINOUS COAL CLEANED IN 1946 AND CAPACITY OF EQUIPMENT SOLD IN 1947, IN THE UNITED STATES, BY TYPES OF EQUIPMENT[1]

Type of equipment	1946			Annual capacity of equipment sold in 1947[2] (net tons)
	Number of plants in operation[3]	Net tons of cleaned coal[2]	Per cent cleaned by each type	
Wet methods:				
1. Jigs	226	64,702,238	46.7	(4)
2. Concentrating tables	10	1,447,200	1.0	(4)
3. Classifiers	68	13,883,088	10.0	(4)
4. Launders	18	16,020,328	11.6	(4)
5. Dense—Media	59	14,172,428	10.2	(4)
6. Jigs and concentrating tables	14	3,776,190	2.7	(4)
7. Other combinations of methods 1, 2, 3, 4 & 5.	21	8,057,167	5.8	(4)
Total wet methods	416	122,058,639	88.0	28,680,000
Pneumatic methods	88	16,611,198	12.0	960,000
Grand total	[5]504	138,669,837	100.0	29,640,000

[1] A small percentage of the equipment sold in 1947 was placed in operation during the year and the balance will be placed in operation during 1948 and 1949.
[2] Includes plants operated by consumers at central washeries in Colorado and Pennsylvania.
[3] Based on 214 days (average days mines were active in 1946) and 8 hours per day.
[4] Included under "Total wet methods."
[5] Includes a duplication of 59 plants using both wet and pneumatic methods; deducting this duplication gives a net total of 445 plants that cleaned coal in 1946.



Production of Bituminous Coal and Lignite

Many mines, once prospects, are large contributors to our national wealth—

★

By CHARLES F. WILLIS

State Secretary
Arizona Small Mine Operators Association

★

Problems of the Small Mine Operators

PRESIDENT Truman recently gave one of the best descriptions of the free competitive enterprise system when he said: "Under that system each man is free to go where he likes, to follow the calling of his choice and to be rewarded in proportion to the productivity of the effort or the property he contributes."

Under free enterprise, the man who invests capital as well as the man who invests his labor in an enterprise is entitled to whatever reward he is able to earn. Under free enterprise, every man is entitled to pursue any lawful undertaking, free of dictatorship and coercion by capital, labor or Government.

Finally, under this or any workable definition of free enterprise, Government must keep out of business. Socialized enterprise and free enterprise cannot long exist side by side. The first will swallow the other and then all basic freedoms will be lost.

Many problems of the small mine operator and many of the answers to them involve cooperation or assistance on the part of the Government. However, it must be kept in mind that the answers proposed are for the relief of a symptom rather than a correction of the basic situation which brought about the problem.

If the small mine operators had any opportunity to return to a true free competitive enterprise system—the kind under which the present great mines of the country were found and developed—the problems would largely disappear and no Government relief would be needed. It is only because the nation is now so far removed from the old days of free enterprise that it becomes necessary to seek remedies for the illness created.

Opportunity and incentive are essential ingredients of a successful enterprise

Continuance of Premium Price Plan Would Have Bridged Conversion Gap

There is no problem of the small mine operator to which this situation is more applicable than to the Premium Price Plan, for free competition was shelved during the war, in so far as copper, lead and zinc mines were concerned, and it is necessary to have a temporary answer to carry over until normal conditions of supply and demand can be restored.

The small mine operators have not yet recovered from the shock of the unexpected veto by President Truman of the Allen bill which would have extended premiums on copper, lead and zinc for a period of two years. There is no question but that the basic reason for the veto was the desire of the State and Commerce Departments to purchase metals from abroad and thus give the foreign countries an income with which to purchase American manufactured goods.

In other words, foreign countries

having mineral resources are to be allowed an opportunity to recover industrially and commercially at the expense of the metal-producing states of the United States. No consideration is being given to the importance, from a national security viewpoint, of maintaining a healthy and going metal mining industry in this country.

It is true that there has been a division of opinion among the mining folks as to the desirability of continuing premiums. But, in spite of this opposition, there is a potent argument as to why the Premium Price Plan should have been continued for a few years. The copper, lead and zinc production during the war was governed by low ceiling prices. Mines were not permitted to have the profits during the war period that were allowed to other industries and, therefore, at the end of the war did not have accumulations of surplus funds built up which would tide them over the period of conversion. It was felt that a continuation of the Premium Price Plan, with understanding administration, could have bridged this period successfully.

It may be, from a long-range viewpoint, that the veto of the Allen bill will prove to be beneficial. If the sentiment aroused by the presidential veto results in the pushing for early enactment of the Russell bill, the mining industry and the nation may, in the long run, be the beneficiaries. The Russell bill would establish a national mineral policy and go far toward providing for the wherewithal to find, develop and produce all the metals and minerals. It would not confine the Government's cooperative effort to copper, lead and zinc, and it would permit putting into practice a more intelligent and less restricted exploitation of our mineral resources.

Stockpiling Means Security

A stockpiling program is essential to the nation under any security program and Government-owned stockpiles should contain more than metals in metallic form. The program should be applied to ores and concentrates, thus insuring a market for all the mines can produce. Furthermore, its administration should make it possible for small suppliers to sell to the Government.

As a result of the high prices of the metals, mining companies owning smelters have been searching the nooks and corners of their own properties for everything which can be sent to their smelters and handled at a profit. It is but natural that any smelter would give the right of way to ores from its own mines, but this procedure has had a detrimental effect on mines too small to have their own plants and which are dependent upon custom smelters. Their market has been curtailed and in some cases even removed. Mines not shut down by the withdrawal of premiums are likely to be shut down by the loss of the market for their product.

There is a possible answer to this problem that should be given consideration. The Stockpiling Act of 1946 provided for Government stockpiling of metals and minerals, and other materials necessary to national defense. It did presume that the materials stockpiled would be in finished form —that is, as metals—but the objectives of stockpiling could be accomplished satisfactorily if the Stockpiling Act were amended to authorize the Treasury Department or the Army and Navy Munitions Board to purchase and stockpile ores containing the metals.

The stockpiling program could be changed easily and simply to meet a current situation and give relief to many small mine operators. It need not be confined to copper, lead and zinc, but could cover almost every metal, with the stockpiling of the ores of that metal at the place where conversion to commercial form is normally done and the handling of the program by the organization which ultimately would make that conversion.

Tariff Protection Required to Support Strong Domestic Mining Industry

If the minerals and metals are to play their proper part in an adequate national security program, it is necessary that a "Buy American" policy be followed by agencies of the Federal Government. Stockpiling for national security should be largely that of United States' produced minerals and metals, and a "Buy American" policy is especially important when it comes to metals and minerals, reserves of which are inadequate in this country.

Our domestic policy of foreign buying is what has built up foreign production of minerals and metals which have been, and can again be, used against us in the event of war. Even more important is the fact that the dumping of those metals and minerals into this country has been instrumental in preventing the development of similar resources within our own borders.

Government restrictions should be imposed on imports in peacetime, in the form of excise taxes or import quota limitations, at least sufficient to place the domestic industries on an equal competitive basis with foreign industries.

Propaganda has been started in eastern manufacturing centers, aimed toward the abolition of the copper excise tax on foreign metal when the current two-year period of suspension is at an end. Those who are propagandizing are looking forward to the time when foreign copper, produced at low costs by peon labor, can dictate the price of the metal in the United States. If that time comes it will be the starting point for the disappearance of the copper industry in this country; and there is no metal more important to national defense and security than copper.

There are several metals for which the United States now depends upon foreign countries, but this is not because of a lack of potential resources. It is because low costs and market control abroad are used to prevent these metals from ever getting started in this country as a going and substantial industry. Typical of this situation, that applies to a number of metals, is the experience of the quicksilver industry.

Only a few minerals or metals do not exist in the United States in quantity adequate for national security and self-sufficiency if the opportunity were given to determine what we have and be ready to supply them when an emergency arises. We are not a "have-not" nation as to these metals, but we can be made one by shortsighted federal policies.

Mining Laws Need Sensible Administration

From some of the mining areas of the nation we hear a demand for a revision of the mining laws relating to mining locations, annual labor, requirements for patenting, etc. As a matter of fact, no extensive revision of mining laws is required. There is, however, a definite need for education of Government agencies, and employes who are administering the use of public land, as to the intent of Congress and the meaning of the wording of the mining laws.

For many years there has been a changing attitude on the part of government agents in their interpretation of what constitutes an adequate mineral showing for the location, holding and patenting of a mining claim. It is only because the laws were liberally interpreted in the early years that we have any mines today. The surface showing of almost any one of the present large and rich mines was such that the present-day bureaucrat would never have permitted the claims to be held or operated.

Extensive Geophysical Work Required

Most of the exposed surface of the country has been explored and further expansion of United States mining is dependent upon what may be found below the surface and not necessarily exposed. The wartime development of geophysical instruments has made possible reliable subsurface exploration and the future of the mining industry depends largely upon the utilization of this scientific progress.

Arrangements should be made

whereby state agencies, using instruments developed during the war, are subsidized by the Federal Government to conduct geophysical surveys, doing the first work where the geology indicates opportunities for finding subsurface mineral accumulations. The ultimate objective should be complete geophysical surveys of all states. Following the complete geophysical survey, the favorable regions should be drilled. This country has one more opportunity to become a "have" nation.

Restrictive Policies of SEC

At one time the small mines of the country were financed and developed under a free competitive enterprise system, and they made possible an ultimate mining industry which was able to supply the metals necessary to commercial progress as well as war requirements. However, that system, which made possible the development of small mines into large ones, has largely disappeared through Government encroachment.

One result of the present laws, rules and regulations and their administration, has been the gradual strangling of primary mining. Curiously enough, however, hundreds of millions of American dollars of venture capital have flowed outside the United States, especially to Canada, for the development of resources in countries which do not have the restraints and restrictions existing here.

A definite need exists for the reorganization of the mining division of the Securities and Exchange Commission so that it may be guided by people cognizant of the problems involved in financing new mines. The SEC law should be amended so that only the "fraud" section is applicable in offering and selling primary mining securities to the public. The SEC laws were designed to regulate investment offers, but were never intended to strangle the speculative instincts which have been so largely instrumental in developing a great and rich nation.

Taxes Take Venture Money

Taxing incomes on a graduated scale, with virtual confiscation of large incomes, has definitely limited participation by the public in new enterprises, as well as in scientific development and research. It was from the higher income groups that venture money came, for they were the ones who had the surplus funds with which to explore new fields and new processes.

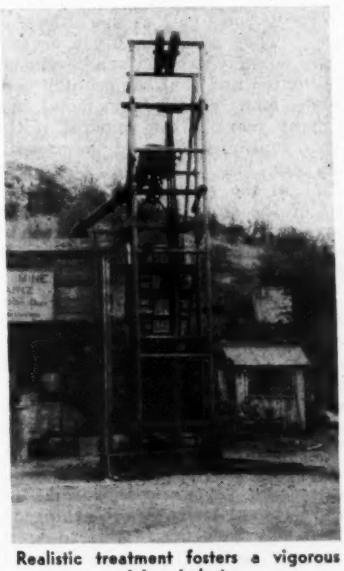
The effect of the present tax structure is alarming to all industry, but especially so to those engaged in mining. Our future mines are coming from the indications found by geophysical exploration which costs more than normal surface prospecting; the development of larger and lower grade deposits which require greater capital investments, and the utilization of more complex raw materials which requires expensive long-range research.

A Government program of relief from taxation of new mines during their early stages has been highly successful in other countries and has provided a stimulus for those who would search for minerals and metals. The finding of new ore bodies has grown more difficult and risky, yet when successful, under our tax setup, the profits permitted to be retained are small and the Government share exorbitant. Some plan of relief from taxation of new mines, until such time as original capital invested is recovered, would prove a tremendous incentive toward the search.

Quasi-Contract Reimbursement

In response to the call of the nation, the small mine operators went ahead to supply the requirements to conduct a successful war and did their job without demanding guarantees or contracts. They appreciated that metals were basically necessary and that time was a vital element.

Therefore, upon the urging of Government departments and agencies, through publicity and solicitation, many mines attempted to deliver metals and minerals and did not wait for contracts, written terms or guarantees. In so doing some sustained a material loss and it is believed that Congressional consideration should be given to clarification of so-called quasi-contract relief—that is, the payment for losses experienced by those who had implied contracts, brought about by their efforts to do what Government agents and agencies said was necessary.



Realistic treatment fosters a vigorous mining industry

Considerable experience with quasi-contract legislation points out how bureaucratic control can and does thwart the will of Congress. That body definitely intended to give relief, in recent legislation, to those who had suffered losses in attempting to do something which Government agencies urged during the war and who did not demand written guarantees before starting their wartime tasks. Yet those who are entrusted with administering the law have gone far astray from the intent of Congress and have done almost nothing toward such relief.

Gold Mine Relief Essential

Order L-208, closing gold mines, was, in effect, Government confiscation of property for war purposes. It took legitimate business away from owners and made a war casualty of gold mines, with definite and measurable costs to those who owned the properties. Legislation should be enacted which would compensate such owners. Their losses in income and property damage have been augmented by the fact that gold price has not been permitted to advance although costs have increased tremendously.

The price of gold is important to the mining industry, but it is realized that the other factors governing the price of gold are much more important than merely the cost of its production. It is felt, however, that the price of gold should be adjusted to its changed relation to costs in general and the present economic picture. Moreover, producers should not be required to sell gold exclusively to the U. S. Government. Gold at $35 per ounce is definitely not at its proper place in the economic picture.

RFC Should Make Mine Loans

Mine loans have been made for many years by the Reconstruction Finance Corporation, and the policy of granting such loans has been instrumental in bringing about a satisfactory exploration of newly-found mineral deposits and in creating new mining properties that required no further Government support.

Curtailment of the mine-loan program of the RFC has come at a time when it should have been expanded. If the nation is to find and develop new resources, the mine-loan program should be revived with provision for repayment of loans out of production and possibly with some Government

profit on the successful venture to compensate for losses in other instances.

If other normal methods of obtaining funds for the opening of new mines were not made impossible by Government edict or law, there would be no demand for RFC loans. However, with all other doors closed, it did offer a possible route, which was successfully used—and now that has been removed.

Organized Labor Abuses

At first glance, it does not appear that the small mine operators should be particularly interested in labor legislation and the tendencies of organized labor which have been prevailing in recent years. They are, however, often more intimately concerned than near-by larger mining operations which have labor contracts and which, for the most part, are unionized.

Of especial concern to the small mine operators is the tendency toward industry-wide bargaining. This means that labor negotiations would be conducted through the larger and better-able-to-pay units of the industry and the smaller mines would be forced to live up to the terms of whatever agreement is reached. This would be regardless of the fact that small mines frequently can get only the older men, the physically handicapped, and the leftovers of minimum productiveness.

Railroad Rate Increases on Mineral Products Lack Justification

Important to the operations of the mining industry are railroad rates, as freight is one of the larger items of costs. There have been continued applications to the Interstate Commerce Commission by the railroads for increases in freight rates. These are based upon the need of greater revenues to meet increased costs, but at no time have the railroads showed, or attempted to show, that freight rates on ores and concentrates were out of line with the cost of performing the service rendered, and no application for an increase should be granted until the railroads make that showing.

Freight rates on ores and concentrates never have been based upon the cost of performing the service but on "all that the traffic will bear," and there is no excuse for varying rates based upon the value of product. Mining is the only industry having variable rates based upon value. Increased freight rates can do much toward decreasing ore reserves and putting mining units out of business. Until the railroads can show that they will suffer a loss in performing the particular service, consideration should not be given them by any Government department controlling railroad rates.

"Have-Not" Situation Does Not Exist but Can Be Created

It should be recognized that conservation of mineral resources is not the keeping of these resources in the ground unexplored and undeveloped, but in maintaining them as readily available as possible for use. The maintenance of a healthy and prosperous mining industry is the superior form of conservation, for most of the metals produced are indestructible and remain continuously in circulation. Determination of what the nation has as to mineral and metal resources is a form of conservation and it is of vital importance that the nation knows what it has and what it can depend upon.

The growing and erroneous belief that the United States is a "have-not" nation, insofar as metals and minerals are concerned, is dangerous to the progress of the mining industry and especially to the small mines.

Not by any stretch of the imagination can the United States be shown to be a "have-not" nation as to minerals and metals but, in view of the present trends along many different angles, it is something that can be created. Every effort to make the United States a "have-not" nation should be vigorously exposed.

Those who have criticized the efforts of administration leaders to plant in the minds of the people the belief that the United States has become a "have-not" nation, in metals and minerals, have been more than generous in not attributing ulterior motives to the propaganda.

They point out that it is only a misinterpretation—not a distortion—of facts. They admit that our ore reserves, already exposed and developed, are limited and that the country does have so many years of this metal, and so many years of this mineral, if the nation continues to use at the prevailing rate, but claim that the error (???) in the reasoning is that only half of the story is being told. The "have-notters" assume that no one is ever going to open up any more of those ores or minerals.

There is something sinister in this propaganda. The sources from which the propaganda originates would indicate a desire to make the U. S. a "have-not" nation. Unfortunately, many of these sources are in position to help to create the situation and conditions which they predict.

One only has to read the personal history and background of some of these national leaders in Washington to see why they desire this to be a "have-not" nation as to minerals and metals. There is another group, working with them arm in arm, which is steering the country toward socialism or possibly communism. This group, by creating an alarm over depletion of our natural resources, is in a position to promote nationalization and government control as the only answer.

There are some among the high officials in Washington who desire to see the United States dependent upon foreign countries for our minerals and metals just as a matter of personal interest and profit. They naturally are getting a strong backing from those who see an opportunity to weaken us now and who may some day be allies of our enemies in warfare. This group is further augmented by the internationalists who want to build up foreign countries and are willing to tear down what this country now possesses to build up the others.

However, if present Washington policies continue, and the same top boys have the opportunity of continuing to pound their propaganda into the ear of the President and his advisers, the country will become the "have-not" nation which they predict. It is a situation which the mining industry must watch closely, and must combat each and every step of any program which will lead in that direction.

Stable Policy Needed

To most of the many problems of the small mine operators the solution lies primarily in the determination of basic policies, together with the assurance that the program decided upon will remain in force long enough that those who undertake the journey will not find conditions changed materially when they arrive at their destination. Temporary expedients are only relief; what is essential is the correction of the conditions which created the need for relief. Therefore, let us pray for an early return to the free competitive enterprise system, as defined by President Truman, where every man is privileged to pursue any lawful undertaking, free from dictation and coercion by capital, labor or Government.

LATEST BULLETINS
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WHITE HOUSE BALCONY UNDER WAY
I TELL YOU WHAT—LET'S BUILD THE ST. LAWRENCE CANAL!

—The Evening Star.

The Role of Geophysics in Mining*

Our Available Tools Must be Fully Utilized and New Tools Must be Developed to Implement the Search for Ore Deposits

By H. R. JOESTING
Geophysicist
U. S. Geological Survey

GEOPHYSICAL prospecting is concerned with obtaining geological information leading to the discovery of mineral deposits, especially where such information cannot readily be obtained by surface examination. In this role geophysics plays a major part in petroleum exploration. Geophysical exploration for minerals, on the other hand, has not been a spectacular success in this country, in spite of its great potentialities.

Many reasons have been advanced for the failure of mining geophysics to live up to its earlier promise. It has been pointed out, for example, that most orebodies are small compared with oil structures; that the complex shapes of orebodies and their controlling structures make interpretation of geophysical measurements difficult; and that because of the small size of orebodies and the complex geologic controls, the cost per acre of geophysical prospecting is high, while the net returns are likely to be low, at least when compared with returns from oil exploration.

These reasons are valid, but they are perhaps not the most important ones. Comparable difficulties existed in developing effective methods for oil exploration, but they were largely overcome. A major reason for the failure of geophysics to fulfill its earlier promise in mineral exploration is that the mining industry itself has so far failed to push geophysical research and development aggressively in cooperation with their geological and exploratory activities.

Mineral reserves in the United States are now being depleted more rapidly than they are being replenished, and more effective means of discovering new deposits must be developed and used. It is true that some large reserves of low-grade material are available which can probably be worked economically by future generations; but the present urgent need is for discoveries of deposits that can be mined and processed under price conditions that may be anticipated during the next decade or two. The chances are decreasing for discovering these deposits by surface geologic investigations alone. The practice of following the ore by surface prospecting and drilling is also approaching a point of diminishing returns, because most of the grass roots deposits have already been discovered and evaluated.

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Vast Area Unexplored

There remain many large areas geologically favorable to the occurrence of ore, but where surface indications are apparently lacking. These include not only areas within present mining districts, but also large areas comparatively remote from known ore occurrences, such as the desert valleys between the mineralized mountain ranges of the Southwest, parts of the Lake Superior, the Adirondack and the Mississippi Valley regions, and other areas in many parts of the country. In these covered areas, geophysical and related methods of prospecting are required to aid in locating hidden orebodies, and to trace zones favorable to ore occurrence. It is important then to determine how to utilize these methods, and to incorporate them into an effective scheme of exploration.

The most direct approach would be first to greatly expand and intensify research in and development of instruments and methods, and second to use geophysical methods in a coordinated scheme of exploration wherever they are utilizable. To be effective, such a program would require far greater expenditures on scientific prospecting than are now being spent by the mining industry, but the total would be small compared with expenditures for drilling and underground prospecting, and would not be out of line with that spent by most industries on research and development. The investment could be further reduced by mutual cooperation between the various mining companies concerned, and between them and Federal and State agencies.

Such cooperation might entail the establishment by the industry of a depository and clearing house for information on development of instruments and methods, and the results of surveys. This would not necessarily result in giving away confidential information on ore tenor or reserves, or on details of instrumentation or methods; but it would make available to the mining geologist and engineer invaluable information on the relative effectiveness of various exploration methods.

Instruments and Methods Of the Future

Geophysical exploration techniques have benefited and will continue to benefit from recent developments in electronics, metallurgy, chemistry and in almost all fields of physical science, but it is doubtful if any entirely new techniques will result from these developments, nor is it likely that basic principles will be radically changed. As at present, we will continue to measure the physical properties of rocks and minerals in place, and attempt to interpret them in terms of geology.

One of the main benefits of recent technological advances will be the development of lighter, more portable, and at the same time more powerful equipment. Another will be the more widespread use of automatic recording and computing instruments. These developments will permit geophysical surveys to be made more rapidly, with consequent reduction in costs.

Improved Magnetic Methods

The airborne magnetometer is a case in point. This war-born development is important simply because it enables large-scale, precise magnetic surveys to be made rapidly and at low cost.

An immediate consequence has been the greatly increased use of magnetic surveys for exploration. An eventual consequence will be the development of more effective technique for interpretations of magnetic data in terms of geology; and the final result will be a reduction in exploration costs.

Following the advent of the airborne magnetometer, similar ground magnetometers have been developed. Although these instruments probably do not offer any great immediate practical advantages over the older

ground magnetometers, they appear to be capable of adaptation to running continuous magnetic profiles on the ground. Mounted in a car-towed trailer, a continuous-recording ground magnetometer would be nearly as valuable for detailed surveys as an airborne magnetometer is for large-scale surveys. Similarly, a ship-towed magnetometer would be of great value for special marine surveys.

Dr. Lundberg's use of the helicopter for magnetic surveys also deserves mention here because it points up the trend toward reducing unit costs by increasing speed.

In addition to the magnetic method, there are an impressive variety of geophysical, geochemical and related methods, together with instruments for measuring electrical, gravitational and other force fields with considerable precision. Some of these methods have been successful; others are as yet unproven.

Electrical Methods Hold Promise

Of the remaining major methods, namely gravimetric, seismic and electrical, the electrical methods appear to offer the most promise of future development, because they permit comparison of the electrical conductivities of geologic materials, which vary between extremely wide limits.

In the conventional electrical-resistivity methods current is introduced into the ground through electrodes connected to batteries or a generator by insulated wires; and variations in conductivity of sub-surface materials are inferred from corresponding variations in potential distribution, as measured at the surface. These methods have been extremely useful in locating both vertical and horizontal discontinuities, such as faults, contacts, shear zones and conductive orebodies; as well as depths of overburden and of water-bearing horizons. Their chief practical limitation is that the necessity of stringing out long lengths of wire and placing electrodes makes them comparatively slow and expensive, particularly when exploring at depths greater than 1000 ft. Some improvement in speed and precision is anticipated through the use of automatic current and potential measuring equipment.

In spite of the cost handicap, resistivity methods will continue to be used until something better turns up, and in addition will find valuable specialized uses. One that comes to mind was mentioned by Professor Slichter in his address before the Metal Mining Convention in 1946. In this method, current is introduced into the ground at any desired depth through drill holes. If either of the two current electrodes is in contact with or near a conducting orebody its presence and position can be inferred from the pattern of current flow, measured either on the surface or from other drill holes. Promising results using an analagous technique have been obtained by the Geological Survey in determining the directional distribution of oil sands.

Another promising development is an electrical method which apparently indicates the presence of metallic conductors, such as sulfide orebodies, by their polarization response to long-period current pulses, and does not similarly indicate electrolytic conductors, such as moist clay beds or horizons containing hard water. Further experimentation is required, but if successful this method will be of great value in prospecting for sulphide orebodies.

Still another electrical method that offers some future promise is the inductive method. This method involves the induction of current in the ground by a primary alternating current flowing through an insulated coil; and the measurement of the resulting electromagnetic field at the surface by means of a second coil and an amplifier. A conducting orebody will set up a secondary field which may be measured at the surface as a distortion of the primary field.

The induction method has been little used in the United States in recent years, partly because of difficulties in interpretation of results and of lack of depth penetration with available equipment. Recent improvements in electronic equipment warrant renewed interest in the method, especially for prospecting for sulfide orebodies at shallow to moderate depths. Its chief advantages are that it is comparatively rapid, because no direct ground contacts are required; in addition some control may be exercised over penetration and response to various types of geologic bodies by selection of favorable frequencies. It is even conceivable that the inductive method could be adapted for use in low-flying planes and helicopters, thereby greatly increasing its speed and utility.

Application of Minor Methods

There remain many methods that will probably be utilized to a greater or lesser degree in prospecting for ore. One of the most promising and one that is receiving increased attention in this country and abroad is the geochemical method. Varying amounts of the metallic elements of ore deposits may be found in surface and underground water, in the overlying residual soil, or concentrated in certain plants and trees. These facts have long been known, but their practical utilization has awaited the accumulation of factual data based on systematic investigations, as well as the development of rapid, sensitive analytical methods suitable for use in the field. Recent work by the Geological Survey indicates that the method is of value in prospecting for zinc, copper, and lead. Reports from the Soviet Union state that it has been successful in prospecting for tin, tungsten, molybdenum, and lead.

Many of the well-logging techniques now widely used in oil prospecting would undoubtedly be of use in mineral prospecting. For example, electric, magnetic, temperature, and radioactive logging could in some cases, at least, give information on structure, rock alteration, and mineralization. Such information could be obtained rapidly and inexpensively from holes drilled during the normal course of a prospecting program. One application of drill hole logging was demonstrated by Spicer who found that the potassium content of strata in the southeast New Mexico potash fields could be determined rapidly and accurately by measurements of gamma radiation emitted by the K^{40} isotope of potassium.

Geologic Interpretation

Improved methods of evaluating geophysical data are of even more importance than improved instruments and techniques. The aim of geophysical prospecting is to find ore, but except for magnetic iron deposits, most buried orebodies cannot be detected directly. It is usually necessary to work indirectly, obtaining information on the probable occurrence of ore, for example, by locating and delineating geologic discontinuities such as contacts, faults or intrusives with which ore may be associated, or which may have exerted control over its emplacement.

This limitation results from the fact that many deposits of metallic minerals are too small, too deep or too low-grade to be detected directly by geophysical methods now available. Geologic structures with which ore may be associated, on the other hand, are usually sufficiently large to be detected by surface measurements. It follows that interpretation of geophysical data must be in terms of geology; and that more effective interpretation will result from fuller utilization of available knowledge concerning the factors affecting ore deposition.

From this resume it is evident that many geophysical methods are available for use in mineral prospecting. Their adequate utilization, however, can be effected only by an aggressive and coordinated program of research, development, and practical application, in which the mining industry must play a dominant part.

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GOLD

Abandonment of the Technical Gold Basis of Our Currency and Return to a Dollar Backed Openly by Gold can Be a Forward Step Toward Curing Chronic Economic Ills—Domestic Gold Production Up in 1947 but Continues to Be Restrained in Face of Mounting Costs

By DONALD H. McLAUGHLIN
President
Homestake Mining Co.

NOTHING unorthodox exists in the situation in which the gold miners find themselves today. With wages and the prices of all materials that are required in the production of gold at the high levels characteristic of a period of prosperity, phony or otherwise—and with shortages of both men and machinery to contend with as well—the spread between the returns in paper dollars that must be accepted for gold in the United States and the cost of producing it is rather painfully small for most producers. Technical improvements, stimulated by the urgency of declining profits, have to some extent, made the decline less drastic in a few cases but the relief to be gained in this way in an industry already smoothly and efficiently operating is at best rather limited. Consequently we find the gold mines throughout the country far below the level of output and profits that formerly prevailed and still struggling to overcome the special financial and physical hardships that were so arbitrarily imposed on them during the war.

On the other hand, faith in the inherent value of gold seems stronger than ever, even though the returns from mining are temporarily below the rate that makes the industry, as a whole, prosperous. This faith is revealed by the persistence of prospecting and exploration in all the gold-bearing regions without apparent decline in enthusiasm and hope. It is most clearly shown by the bold and immense expenditures on deep shafts and large plants that are being made with confidence in new enterprises on the extensions of the gold-bearing reefs of the Rand and on the newly-discovered deposits in the Orange Free State.

Faith in gold is maintained and strengthened by the same conditions that create the temporary difficulties of the producers; namely, inflation through the vast increase in debt and monetary obligations of our own and practically all major governments. As these extensions of credit increase without corresponding increase in wealth, the value of the units in which they are expressed must necessarily decline, with the result that less and less is received for a paper dollar, franc, pound or whatever may be used to measure the IOU's of a government.

Free Currency-Gold Exchange Would Help

It is not gold that is becoming more valuable in terms of goods and services; it is the paper currencies or the promises of governments to pay that are becoming discounted by their unchecked expansion. Under these circumstances, the gold miner would have nothing to fear or complain about if he were allowed to meet his bills and payrolls with his product. He is, however, penalized by being forced, in accordance with the pattern set by practically all governments as they move more and more toward rigid regulation and curtailment of free enterprise, to accept payment in a depreciating currency at a fixed rate. The growing strength of gold creates confidence that mines with good reserves or prospects for ore offered a means of preserving basic values as the paper currencies weaken. But, on the other hand, the protection that this gives to the owner of a gold mine is seriously reduced by the arbitrary restrictions on freedom to hold or use the gold that are imposed by most governments in their efforts to conceal the inevitable results of excessive extensions of their credit.

From the beginning of the New Deal to the outbreak of the war the increase in paper obligations far outstripped the growth of tangible real assets of the nation that were, in

final analysis, the security behind the promise to pay. And then, on top of these serious burdens created by the naive policies of the Roosevelt administration, the war had to be financed by still more extreme promises in bonds and currency, made far more difficult to fulfill by the appalling losses of the great conflict. Now, even though the fighting is over, the restoration of some measure of economic order requires a continuation of expenditures at almost comparable levels which will inevitably result in still further claims that must eventually be met in some way or another.

This sequence of disasters—for even a victorious war is inherently a disaster when its cost to the victors is so great—was necessarily financed with credit—or with promises. No gold standard as simple as that which was so effective an instrument in the well-ordered world prior to 1914 could survive such extremes. With urgent demands of a magnitude far beyond amounts that could be met by taxation, government debts reached a peak that would surely have seemed fantastic to even the most liberal of bankers or economists in pre-war years.

Will Further Inflation Wipe Out Gold Mining?

Such conditions create particularly difficult times for those engaged in gold mining, and yet at the same time they make gold seem to be the only form in which monetary values are likely to be preserved. Faced with this rather paradoxical situation, the gold producers must indulge in some hard thinking about their immediate future. Should they simply expect a slow extinction of their enterprises as costs rise and their product is taken at a fixed price in a depreciating currency that they must accept? Or should they expect that inflation will not go far beyond present levels, but that the reduced returns now prevailing from gold mining are likely to be the best for some time—with gold held at $35 per oz? Or are the present and potential obligations represented by our debt and paper currency already so great that gold at the current price will become so out of line with its true purchasing power—domestically as well as internationally—that a new adjustment to the depreciated paper dollar may be forced? These are basic questions for anyone who is interested in gold mining.

Surely a dollar tied to gold would be desirable. Gold is one of the most stable elements, and the available stock is large, but not excessive for its proper function. The annual increment is not disproportionate to the yearly increase in the world's wealth. The scarcity and cost of obtaining gold from the small amounts distributed through well-concealed deposits make it impossible for any government, company, or individual to bring about an abrupt significant change in output. Consequently, gold possesses a strength and a resistance to manipulation that no paper currency without its backing has ever had. Even the dollar can be fixed in terms of gold only if its integrity is maintained by avoiding the creation of extreme obligations. The commitments and promises that have been made are already excessive in terms of gold priced at $35 per oz. If credits are still further extended, with a national budget still out of balance, the discrepancy may become so great that the present gold price will be as unrealistic as the prices of commodities in certain foreign currencies at the so-called official rates of exchange.

A government which abuses its power to create debts and to issue paper money can no more hold gold to a fixed price in its depreciating currency than can it maintain the fiction of fixed prices for foods and other essentials as its paper weakens. Even under the totalitarian governments, black markets result, and the recent depreciation of the ruble—or virtual confiscation of the savings of the workers who had trusted the promise of the government to honor their paper—indicates that the Russians, themselves, cannot disregard these principles with immunity.

The price of $35 an oz for gold was set in 1934 by a group of lighthearted and excited experimenters in a cavalier way that seems almost without precedent in serious economic history. The price selected may well have been too high at the time, but by 1939 the excesses of the New Deal had so depreciated the dollar that I am inclined to think that most of us would have preferred to receive an ounce of gold in place of thirty-five paper dollars if we had been given the privilege.

Increased Gold Price Would Check Inflation

What the prevailing price would be, if we had a free coinage today, is difficult to say. In my own opinion, an ounce of gold—which, when coined, would be about the size of the old twenty dollar piece—would command more than could be purchased for thirty-five paper dollars—and if the attempt were made to issue such coins, stamped $35 and legally exchangeable only for this amount of currency or its equivalent in goods, they would go out of circulation, as might be expected under Gresham's Law. If such a price could be established by some practical and empirical means, the stabilization of the dollar at that level with complete interchangeability of gold and paper would undoubtedly be a most beneficial step. With this accomplished, the adjustment of the various currencies of the world to gold and the dollar would be a relatively easy way of correcting the fictions that are solemnly agreed upon in today's official exchange rates.

If an increase in the price of gold in paper dollars resulted from such free interchange, as I feel confident it would, such action would not in itself be inflationary. On the contrary, it would be one of the most effective means of checking further inflation—of holding the dollar from becoming weaker, provided the strict discipline of gold at the price agreed upon was accepted completely and honestly. The new price would merely be recognition of the degree of inflation (or depreciation) of the paper dollar that has already taken place. A higher price of gold would no more influence domestic prices in dollars than did the increase from $20.67 to $35 per oz in 1934. But it would be an admission of the weakness of the dollar, and of the present degree of inflation, and this probably is too much to expect the Government, or the Treasury, or the dominant banking authorities to face.

Events Can Lead to Chaos or Stability

A course of disastrous events, which one in a cynical frame of mind might anticipate with some logical justification, could well be as follows: (1) Further provision of large credits to Europe, thereby providing a mechanism for payment for the heavy excess of exports over imports for a time with our own money; (2) maintenance of tariff barriers that would prevent repayment of credits of foreign loans in goods; (3) exhaustion of credits and drastic decline of exports. These steps would lead to depression and probably an increase in the price of gold in a desperate effort to preserve our foreign markets (i.e., selling our goods for a relatively smaller quantity of gold than at present). By that time the next war would probably be upon us, and the problem of dollars and gold would be of only academic interest. Of course, such a sequence doesn't make any sense whatever, but this road was followed once before and we seem again to be setting out on it.

Such events—up to the outbreak of war—might bring some temporary relief to the gold miner who is most prosperous in times of depression, provided he had not in the meantime fallen beneath an authoritarian or totalitarian government that still further restricted the benefits that would normally result from the possession of

gold in a world of free enterprises and open international markets. A much better sequence for all concerned —gold miners included—would be one that progressed toward a stable economic world, with well-balanced multilateral trade, without barriers or tariffs, subsidies or premiums.

To achieve a well-ordered economic world again and to reduce the burden of debt to a level that might be tolerated by future generations will probably require the acceptance of some measure of inflation or depreciation of the dollar. A well-ordered economic world may not be possible of achievement as long as the financial systems of practically all nations are dominated by debts and obligations of such overwhelming magnitude as now exist. It seems futile to expect that future generations will tolerate the taxation that would be necessary to reduce them to any significant degree. Outright repudiation at least of domestic debts is unlikely except as the result of national catastrophes. It has been approached, even in victorious nations, as a Frenchman whose insurance policy dates from 1914 undoubtedly realizes. A third mechanism is inflation, if prevented from going to the extreme that is indistinguishable from confiscation and if held strictly to some thoughtfully determined limit.

If the inflation of the dollar is no worse than the present, we could consider ourselves lucky. Inflation is particularly unfair to the most thrifty members of the community. But, in view of the extravagances of the New Deal, the losses of the war, and the responsibilities of the peace, can anyone expect that the debts will be repaid in the units in which they were incurred? "Financing" a war or govment extravagances with paper is a different thing from paying for them. The settlement is merely postponed. In one form or other the destruction and wastes must still be paid for.

In the end the people who saved money, who bought bonds, who made their own provisions for old age through insurance—in other words the hard-working, thrifty core of the population upon whom the Republic depends—will probably have to meet a substantial fraction of the Government's debts and other obligations through this admittedly deceptive mechanism of inflation.

If some degree of inflation is unavoidable, as I am afraid it is, a tolerable level must be adhered to or inflation becomes the most painful of the unpleasant alternatives. This could most decisively be accomplished by redefining the dollar in terms of gold, with provision of the right to exchange the currency for gold at the stated rate. It would involve selling gold by the Government at the fixed price and not merely buying it as is done at present. If this were done with the firm intention of holding the price of gold at the agreed-upon level and accepting the restrictions on further expansion of debts, currency, and other obligations that this would imply, a long step toward monetary stabilization would have been taken.

Extensive European Aid May Tip the Balance

This end probably would be possible if European aid were restricted to the minimum that humanitarian relief required, with further credits limited to specific transactions for

Photo courtesy Explosives Engineer.

By-product gold made Utah Copper the leading 1944 gold producer in North America. In 1947, Homestake held the lead position

which settlement in goods would be expected as they became available. Without removal of tariff barriers, futile, for as long as trade remains grossly unbalanced with exports in great excess, gold would again be the only means of making payment and would again flow into the United States at a disturbing rate. With a common sense recognition of our great need for imports and a realization that no other means of payment for exports is of any benefit to us in the long run, we could certainly preserve a dollar backed openly by gold, prevent inflation from reaching an excessive degree, and provide a sound base of reference for the currencies of the world.

No one need have any fear for the survival of gold as a medium of exchange and as a safe means of preserving wealth. Our concern rather is for the survival of the right to engage in gold mining under conditions that provide the stimulation and incentive of profits to reward those who take risks and who have skill and good fortune. This end will be best attained by the steps that lead to a stable economy; . . . sound money, well-balanced trade, and freedom of enterprise under a government with laws protecting the individual and minorities that are respected. Under these conditions, it would be a certainty that the price paid for gold in the prevailing currencies and the costs of producing it in the same terms will be in such ratio that the output of the gold mines will be maintained at a rate adequate to meet the nation's and the world's needs.

World Gold Production Is Maintained

In spite of debate about the price of gold and the balancing fears and hopes, gold production is being steadily maintained throughout the world, though substantially below the peaks of the past and even below the totals for 1946. World production, outside of Russia, will probably be close to 20,000,000 oz in contrast to 21,400,000 oz in 1946 and over 34,000,000 oz in 1940. The dominance of the Rand as the foremost gold mining region remains unchallenged, though new production from mines recently developed along the western extensions of the Reef has not yet been sufficient to match the decline in output of a number of the great older properties such as the Crown, Government Areas, and Randfontein where the limitations imposed by current costs and operating conditions have been particularly troublesome. The growing production from Blyvooruitzicht and other mines developed on the reefs beneath unconformable cover far to the southwest of the Witwatesrand proper, and the potential output from mines on the recently discovered reefs in the Orange Free State long postpones the day when the position of South Africa as foremost gold producer might be lost.

Canadian gold production in 1947 will probably be over 3,000,000 oz, in spite of the handicaps imposed by the adjustment of exchange and the lack of relief of comparable benefit. This total, however, was slightly above that for 1946 (2,800,000 oz) but still far below the figures for 1940 (5,300,000 oz).

In the United States, the climb back to what would have seemed normal production in pre-war years has been much slower than expected. Many mining companies have found the margin too small to justify the expense of re-opening, and large operations have been unable to attain full capacity on account of lack of miners or supplies. A total output of around 2,300,000 oz for the year is indicated which compares favorably with 1,625,000 oz in 1946, but not with the 5,300,000 oz turned out in 1940.

Elsewhere in the world the story is about the same as in the United States and Canada, namely slow recovery as difficulties remaining after the war period are overcome but at a rate that is rather below expectations. Russian production probably follows the same pattern but data are lacking. With curtailment of dollar credits, the settlement of trade balances will probably have to be made in gold before long. These balances may be small if transactions are kept on the level of barter as may well happen.

The Homestake is the only mine outside the Rand whose production in 1947 would entitle it to be listed among the first 12 of the world, and it barely made the last place in this group. In 1946, however, neither Homestake nor Hollinger ranked among the first two dozen mines in output, but considerable improvement is to be noted over 1944 when the Utah Copper operations held the honor of being the leading gold mine in North America. Now, however, it seems relegated to third or fourth place, and Homestake is again at the top on this continent though pretty far from its old rank of fifth in the world in annual output, as it was in 1940. As in Canada, lack of miners at the major properties is the principal reason for their relatively low production.

Realistic Consideration Can Keep the Lid On

With regard to prospects for the gold mining industry in 1948, probably it is most reasonable to expect that the world's output (outside of Russia) will hold at about the present level. The continued decline of the older mines on the Rand is likely to be offset by the many new properties now being actively developed, which should not be handicapped by too serious delays as Britain, with its usual foresight, is giving high priorities to manufacture and export of machinery for gold mining in South Africa. Some plan to assist gold mining in Canada will probably be carried through, but the most recently proposed scheme seems so complicated that it is likely to be of benefit principally to those who will make a living by its administration. Although the objections raised by the American Treasury made little sense, the various Canadian proposals do seem a rather futile way to approach the problem. (Why our Treasury officials would prefer paper credits to gold is difficult to understand; until some effective steps are taken to increase imports from Canada or other countries, no other choice seems to be possible.)

In the States and Alaska, there is likely to be some increase in output of gold as the major underground mines, such as Homestake, Idaho Maryland, and the mines that supply ore to the Golden Cycle, are successful in obtaining more skilled miners, and as dredging operations of Natomas, Yuba and the United States Smelting Refining & Mining Co. attain the men they need. Comparable increase in earnings, however, is not as likely with costs at present or on higher levels.

Gold Market in 1947

Although the gold market was of only academic concern to the American miner, the demand for the metal elsewhere and the prices paid for it have been watched with more than passing interest during 1947. In spite of the efforts of worried Government agencies and their obvious anxiety to conceal the declining value of their paper in terms of gold, markets apparently still exist in many parts of the world where an individual can secure some measure of protection by putting his funds in gold; and the high prices that are being paid for this privilege are rather a sad indication of the lack of confidence in printed promises.

A conspicuous factor in the gold market in 1947 were the efforts of the International Monetary Fund to prevent the sale of gold at premium prices. During 1946 and continuing into the summer of 1947, large shipments of gold to the Near East and Far East had taken place. For the most part, this gold was obtained from Mexico in the form of new gold coins known as "centenarios" and from the United States in the form of bar gold resulting from the refining of foreign ores. Prices paid abroad were in the neighborhood of $43 per oz. On June 25, 1947, the

Mexican Government, probably not entirely on its own initiative, placed an embargo on further exportation of centenarios. On July 18, 1947, the United States requested persons within this country to refrain from extending facilities for the sale of gold in foreign markets at premium prices. This was made authoritative on Nov. 24, 1947, when the provisional regulations issued under the Gold Reserve Act of 1934 were amended to permit only semi-processed gold to be exported for industrial use and to allow the export of gold recovered from imported gold-bearing material only when refiners in the United States did not participate in the sale of the refined gold. As some confusion still seemed to exist with regard to what could or could not be done, the Treasury still further tightened its control of gold exports by ruling at the first of the year that gold derived from products imported for processing could not be re-exported if any U. S. national or U. S. firm participated in the sale of the gold. A refiner may now handle gold-bearing material simply on a service-charge basis and then re-export it to its foreign owner. License to re-export will be denied if any American citizen or company profits from the re-sale or participates in it.

Other nations, notably Great Britain, have followed suit by imposing more and more restrictions of one sort or another, probably under pressure from the United States. But, in spite of it all, international dealings in free gold, without the blessing of government agencies, are reported to be between $25,000,000 and $35,000,000 per month. This is compared with a volume of $35,000,000 to $45,000,000 per month a year ago, which rather suggests that the efforts to impose arbitrary restrictions on gold without recognizing limits to the power of governments to expand their paper commitments are likely to be futile.

In one way or another, international dealings in gold at premium prices are being continued, either within the law by devious methods or directly contravening the laws of some countries in a few cases, and it can hardly be claimed that the International Monetary Fund's drive to secure world-wide acceptance for the established official price of $35 (U. S.) per oz has met with complete success. In the meantime, the Canadian move to pay a premium for domestic gold produced under certain operating conditions, although a rather indirect approach, actually amounts to approval of an increase in price above the equivalent of $35 per oz. There is talk in Australia of a similar step, which is likely to materialize when the relatively mild benefits given gold miners through easing of certain taxes wear off. The West African gold miners are said to be pressing for a bonus or subsidy in order to maintain output. The difficulties of the mining industry in South Africa are already becoming serious, and demands on their part for aid are not likely to go unheeded. If it finally appears that the gold currently produced in the major foreign mining countries is virtually commanding a price above $35 per oz—with official sanction in one way or another—it might well be doubted if the International Monetary Fund could successfully resist the world-wide pressure for a higher price in terms of dollars.

Little improvement in the over-all situation seems probable unless steps are taken to check inflation by redefining the dollar in terms of gold at a price which would reflect current purchasing power. This action must be accompanied by willingness to accept the discipline that free interchange of gold and dollars would exert on further expansion of debts and credits. As this would require more foresight and less pre-occupation with the minutiae of finance than there is reason to expect from our rulers, it seems safer to predict that we shall travel along the same road of expanding credits and foreign loans with unbalanced exports until the financial lid blows off violently again. Gold will undoubtedly emerge unscathed but the American gold miner, stockholders in gold-producing companies, and the gold-mining communities in the West may have some bad times unless they see to it that their place in the economy of the country is properly respected.

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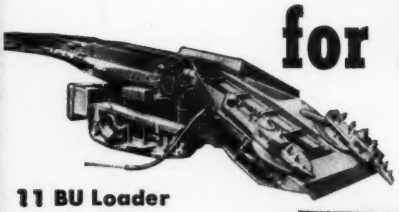

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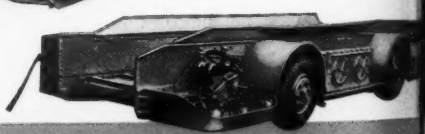

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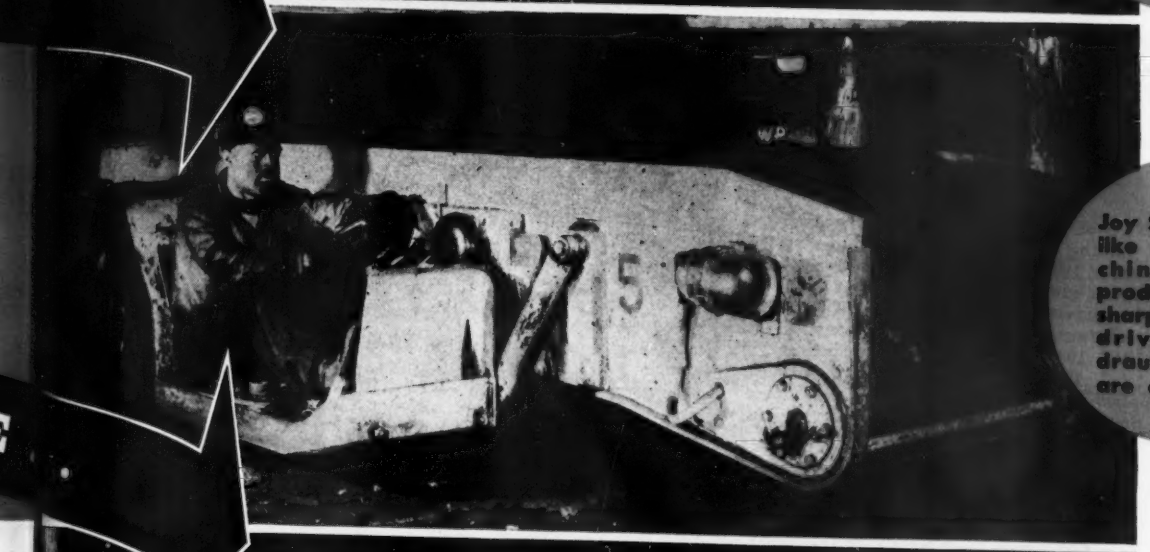

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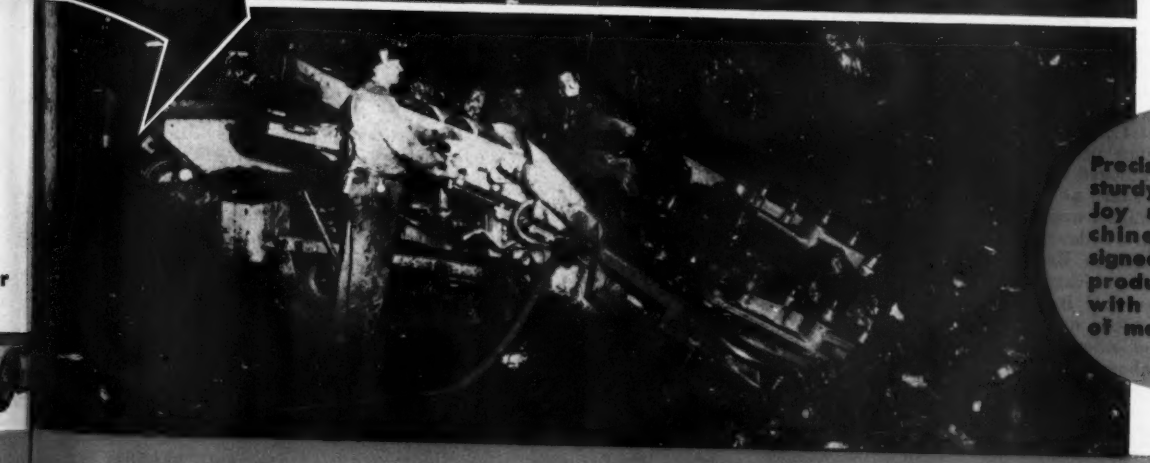

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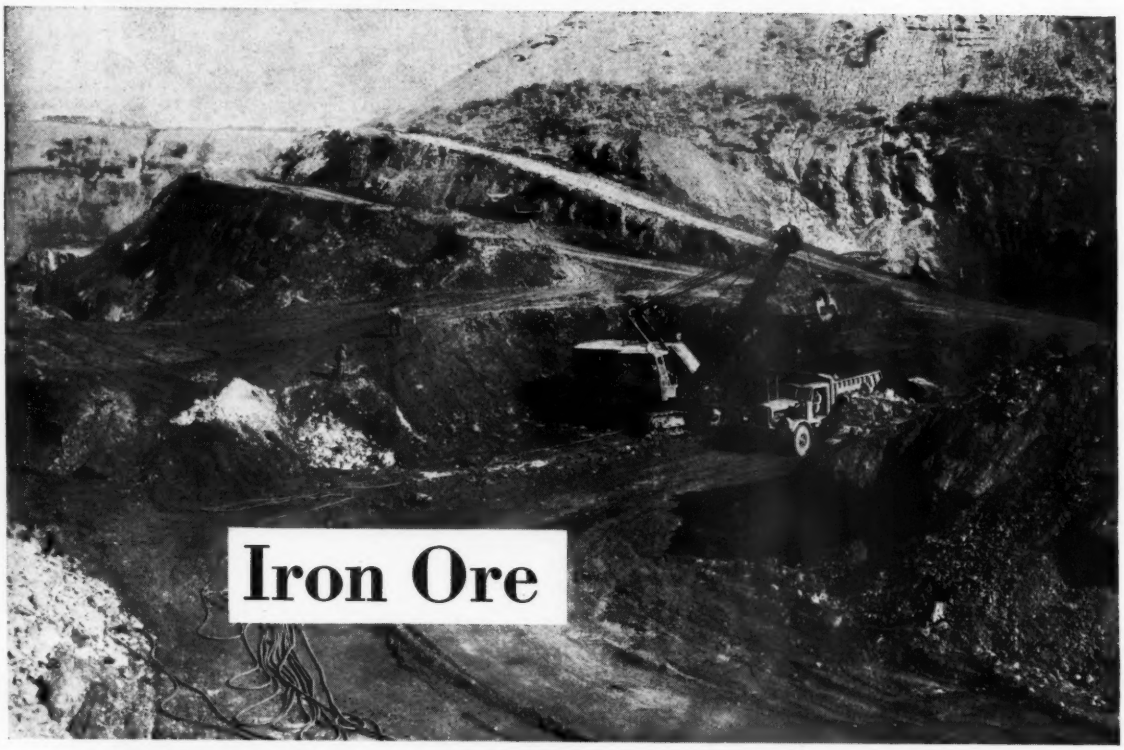


Iron Ore

Ore from the Cuyuna Range totals 3 per cent of Lake Superior shipments. The Mesabi supplies 75 per cent

By M. D. HARBAUGH
Vice President
Lake Superior Iron Ore Association

SHIPMENTS of iron ore from the several mining districts of the United States in 1947 were approximately 93,572,000 gross tons, a figure which has been exceeded only slightly in 1941 and substantially in the three war years, 1942, 1943, and 1944. Of the above total, the Lake Superior district supplied about 79.6 million tons; the Southern States, mainly Alabama, Georgia, Missouri, and Texas—8.2 million tons; the Northeastern States—New York, New Jersey, and Pennsylvania—3.8 million tons; and the Western States—mainly Wyoming, Utah, California, and New Mexico—3.7 million tons.

In addition to the domestic supply, imports reached a new peak of approximately 4.8 million gross tons of which about 1.6 million was from the Ontario mines in the Lake Superior district and moved to lower lakes furnaces—the same as other lake ores; about 1.7 million was from Chile; 1.1 million from Sweden; and the balance mainly from Cuba, Brazil, Mexico, and North Africa. Except for the Canadian ores used in the lake region and the Mexican ores used in Texas, most of the other imports were for eastern seaboard furnaces, although some from Sweden and Brazil moved west to the Pittsburgh area.

Partly offsetting the imports, however, were exports of Lake Superior ore from the United States mines of that district of about 2.8 million gross tons—all but some 2400 tons being for use by Canadian furnaces in Ontario.

Table 1 shows, for the past six years, the ore shipments by producing districts of the United States, together with the total imports and exports. Manganiferous iron ore is included—as usual—in these Lake Superior ore figures. It is noted from this table that the Eastern district and especially the Western district show appreciable increases over the entire six-year period; and that the output of the Southern district is the largest since 1943. All of these increases are reflected in the slight declines in the percentages of total United States ore supplied from the Lake Superior district in recent years.

The lake movement of the Lake Superior ores, which began the first week in April, was concluded in the first week in December, with the record peace time shipment of 77,898,000 gross tons from both United States and Canadian ports. The all-rail movement—mostly to Duluth furnaces—added approximately 1,702,000 tons, to make the total of 79,600,000 above noted.

Consumption of Lake Superior ore in United States furnaces was 77,978,000 gross tons and at Canadian plants, 2,829,000 tons, making a total of 80,807,000 tons, which exceeds the Lake Superior shipments for the year by more than a million tons. Consumption of Lake Superior ore reached a monthly peak for the year in October, of 7,151,000 gross tons, and exceeded 7,000,000 tons in January and November. Thus, the consuming capacity of the existing furnaces, when operated without undue interruptions, has been at an annual rate of about 85,000,000 gross tons.

Table 2 shows a comparison for the past six years of shipments and consumption of Lake Superior ore, together with the stocks available at furnace yards and Lake Erie docks on significant dates. It is noted from this that stocks on hand on May 1 and on Dec. 31, 1947, were 13,555,000 tons and 36,095,000 tons, respectively, which were the lowest in any year since 1937. Anticipated stocks on hand by April 1, 1948, are expected to be about 14.5 to 15.0 million tons—slightly more than two months supply for the furnaces dependent on them. It is obvious that the 1948 lake movement of ore must get under way as early as possible.

Table 3 shows the Lake Superior ore shipments, by individual ranges, both United States and Canadian, for the past six years. Notable is the substantial increase in Canadian output, with the production from the Steep Rock Lake mine reaching more than 1.2 million tons in 1947—its fourth year of shipments.

Calculation of Ore and Scrap To Meet Steel Output

Table 4 shows that steel ingot production in 1947 was about 84.8 million net tons, compared to 66.6 million the previous year; and pig iron output in 1947 was 59.3 million net tons as compared with 46.5 million in 1946. Ferrous scrap consumed was about 59.5 million net tons compared to 43.4 million in 1946.

This table shows the relationship of the total iron and steel produced in the United States to the over-all consumption of pig iron, scrap, and Lake Superior ore. In view of the preponderance of iron and steel production based on the use of Lake Superior ore, it is evident that the ratio of such ore consumed in the United States, to total iron and total steel produced, should remain fairly constant. These ratios are interesting, and useful in furnishing a quick rule-of-thumb for estimating the over-all Lake Superior ore requirements from the anticipated United States over-all iron and steel requirements. Similarly, the ratio of total scrap consumed in all types of furnaces to total steel produced is nearly constant and furnishes a quick measure of scrap requirements to meet anticipated steel output.

The current high rate of operations in the production of iron and steel throughout the country, reflects the sustained, and, as yet, insatiable demand for ferrous products, which shows no signs of abatement in the ensuing year. Substantial additions to blast furnace capacity are underway, through completion and putting into operation of some war-built facilities heretofore not used, through additional new construction, and the rehabilitation of several old furnaces long idle. Also, limited application of some of the new developments in furnace practice which have been under test the past few years—including high pressure and oxygen enrichment of blast—will further add somewhat to the capacity of a number of furnace plants.

Steel Expansion Plans Call For More Ore

Current expansion programs—when completed—are scheduled to further increase steel ingot capacity more than 2.0 million tons and pig iron capacity about 3.0 million tons. This is on top of almost 3 million tons increase in ingot capacity and 1.7 million tons in pig iron capacity effected in 1947. The additional blast furnace capacity dependent on Lake Superior ore, to be put into operation during 1948, will require at least 3 million gross tons of ore for operations up to the first of May, 1949—when the next season's ore supply would begin to be available. On an annual basis, these facilities will require about 4 million tons of ore.

The continued scarcity of ferrous scrap proportionately increases the demand for pig iron for steel-making, hence the pressure for more and more blast furnace capacity. Scrap, as usual, defies accurate statistical analysis—except in retrospect—and each year of high demand is accompanied by increasing uncertainty as to the potential supply available. If the ore supply were as uncertain—which it is not—the situation would be chaotic, to say the least.

TABLE 1—SHOWING IRON ORE* SHIPMENTS BY PRODUCING DISTRICTS OF THE UNITED STATES, AND IMPORTS AND EXPORTS

District	1942		1943		1944		1945		1946		1947	
	Gross tons (millions)	Per cent of total	Gross Tons (millions)	Per cent of total	Gross tons (millions)	Per cent of total	Gross tons (millions)	Per cent of total	Gross tons (millions)	Per cent of total	Gross tons (millions)	Per cent of total
Lake Superior: Minnesota, Michigan and Wisconsin.	93.01	87.10%	85.98	85.85%	81.86	85.52%	75.96	85.35%	59.67	84.40%	77.9	83.2%
SOUTHERN: Mainly Alabama, Georgia, Missouri, and Texas	9.21	8.63%	8.53	8.52%	7.40	7.73%	6.66	7.48%	6.60	9.34%	8.2	8.8%
Eastern: New York, Pennsylvania, and New Jersey	3.08	2.88%	3.19	3.18%	3.50	3.66%	3.62	4.07%	2.25	3.18%	3.8	4.1%
Western: Mainly Wyoming, Utah, California, and New Mexico	1.48	1.39%	2.45	2.45%	2.96	3.09%	2.76	3.10%	2.18	3.08%	3.7	3.9%
Total	106.78	100.00%	100.15	100.00%	95.72	100.00%	89.00	100.00%	70.70	100.00%	93.6	100.0%
Imports	0.73		0.40		0.46		1.19		2.82		4.8	
Exports	2.52		2.42		2.16		2.06		1.51		2.8	

* Exclusive of "by-product" pyrite cinder and sinter from various sources.
Sources: U. S. Bureau of Mines, Lake Superior Iron Ore Assn., and others.

TABLE 2—TOTAL LAKE SUPERIOR IRON ORE SHIPMENTS, CONSUMPTION, AND STOCKS ON SIGNIFICANT DATES
In Gross Tons—Thousands

	1942	1943	1944	1945	1946	1947
Shipments:						
By lake—						
From U. S. lake ports	91,004	83,961	80,691(a)	75,110(b)	58,079	76,267
From Canadian lake ports	473	444	479	605	1,278	1,631
Total by lake	92,077	84,404	81,170	75,715	59,357	77,898
All-rail—						
From U. S. mines	1,396	2,016	1,183	1,209	1,492	1,633*
From Canadian mines	14	1	.....	57	164	69
Total All-rail	1,410	2,017	1,183	1,266	1,656	1,702*
Total shipments—lake and rail	93,487	86,421	82,353	76,981	61,013	79,600
Ore Consumption:						
By U. S. furnaces	83,714	86,585	84,734	72,200	60,291	77,978
By Canadian furnaces	2,511	2,442	2,513	2,376	1,802	2,829
Total consumption—U. S. & Canada	86,225	89,028	87,247	74,576	62,093	80,807
Stocks on hand—U. S. and Canadian:						
At furnaces and Lake Erie docks—						
On May 1	20,065	18,497	17,892	16,429	23,079	13,555
On Dec. 31	47,424	43,429	37,824	39,059	37,465	36,095

Source: The Lake Superior Iron Ore Assn.
* Partly estimated.
(a) Includes 16,411 tons Canadian ore loaded at Superior, Wis.
(b) Includes 352,033 tons Canadian ore loaded at Superior, Wis.

TABLE 3—MINE SHIPMENTS OF LAKE SUPERIOR IRON ORE, TO LAKE PORTS AND ALL-RAIL
In Gross Tons—Thousands

	1942	1943	1944	1945	1946	1947(a)	Per cent of Total 1947
U. S. Ranges							
Mesabi	70,280	64,906	62,509	58,369	46,326	59,476	74.7
Vermilion	1,925	1,779	1,539	1,446	1,330	1,371	1.7
Cuyuna	3,036	3,066	2,538	3,016	2,354	2,649	3.3
Total Minnesota	75,300*	69,971*	66,586	62,831	50,010	63,496*	79.8
Gogebic	6,238	5,487	5,604	4,304	3,717	5,251	6.6
Marquette	6,541	5,601	4,790	4,585	3,270	5,675	7.1
Menominee	4,930	4,903	4,876	4,241	2,590	3,476	4.4
Total Michigan-Wisconsin	17,709	15,991	15,271	13,130	9,578	14,402	18.1
Total U. S. Ranges	93,009	85,962	81,857	75,961	59,588	77,898	97.9
Canadian Ranges							
Michipicoten	487	451	482	514	610	491	0.6
Steep Rock	.....	.....	17	505	831	1,209	1.5
Total Canadian	487	451	499	1,019	1,441	1,700	2.1
Total Lake Superior	93,496	86,413	82,356	76,980	61,028	79,598	100.0

* Includes some limonite ore from Spring Valley district in S. E. Minnesota.
(a) Subject to correction when final mine figures are available.

TABLE 4—PRODUCTION OF IRON AND STEEL IN THE UNITED STATES IN RELATION TO CONSUMPTION OF PIG IRON, SCRAP, AND LAKE SUPERIOR ORE

In Net Tons—Thousands

	1942	1943	1944	1945	1946	1947
A. Pig iron produced (including ferro alloys)	60,903	62,770	62,866	54,919	46,515	59,210
B. Steel produced (ingots and for castings)	86,032	88,837	89,642	79,702	66,603	84,784
C. Pig iron consumed (a)	59,042	60,315	60,952	53,187	39,949	58,495
D. Ferrous scrap consumed–Total (a)	60,265	61,651	61,359	56,191	43,442	59,503
1. Purchased scrap	27,136	26,614	25,923	25,230	20,435	28,444
2. Home scrap	33,129	35,037	35,426	30,961	23,007	31,059
E. Ratio of D to B (i.e., tons scrap consumed per ton steel produced)	0.70	0.69	0.68	0.70	0.65	0.70
F. Lake Superior ore consumed (net tons)	93,760	96,975	94,902	80,864	67,526	87,335
G. Ratio of F to A (i.e., tons L-S ore consumed per ton pig iron produced)	1.54	1.54	1.51	1.47	1.45	1.47
H. Ratio of F to B (i.e., tons L-S ore consumed per ton steel produced)	1.09	1.09	1.06	1.01	1.01	1.03

Authority:
A & B—American Iron and Steel Institute.
C & D—U. S. Bureau of Mines.
F—The Lake Superior Iron Ore Assn.
(a)—In *all* types of furnaces.

Numerous blast furnaces now in production have been operated almost continuously for the past several years and are scheduled for reconstruction, relining, or other repairs. Such shutdowns necessarily change the ore-consuming capacity from time to time, but it appears unlikely that such intermittent interruptions will cause any appreciable decline in the over-all rate of ore consumption shown in recent months. As noted above, for Lake Superior ore alone, that has been at the annual rate of about 85 million gross tons—combined United States and Canadian consumption. If to this figure is added the 3 million tons required for the capacity to be added in 1948, the indicated total requirement for the ensuing shipping season is about 88 million gross tons. Deducting nearly 2 million tons for the all-rail movement—mostly to Duluth furnaces—leaves 86 million tons to be moved by lake. This figure makes no provision for increasing the carry-over for the spring of 1949; but just now it would require prophetic vision to see what the 1949 iron ore demand may be. However, some slackening of pace would seem to be in order before the end of 1949, in any event. Except for the loss of millions of tons of iron and steel occasioned by numerous and unwarranted strikes in 1946, the demand for more production even now might have been somewhat less pressing and the "catch-up date" somewhat nearer at hand.

However, the immediate task—which is of enough concern—is to meet the 1948 requirements. The American lake fleet will be kept fully occupied, and a substantial movement by Canadian ore carriers is anticipated—assuming that Congress again grants permission for the latter to enter into the American ore trade, as has been done since the beginning of the war period, 1941.

Lake Superior District—Activity in mining, stripping, shaft sinking and other development, and in exploratory drilling in the Lake Superior district was at high levels throughout the year. Employment was at a peak, estimated at over 26,000. Improvements in equipment and in techniques for more efficient handling of great volumes of overburden and of ore in open-pit operations, have been continuously evident. Diesel locomotives tend to replace steam for large pits using rail haulage; and trucks up to 30 and 35 long tons capacity are in use at some operations, with still larger units under development. Stripping by means of large dragline equipment to be used in combination with belt conveyors or truck haulage is a recent development. Two such installations—using conveyors—are being made on the Mesabi range to start operations sometime in 1948. Several new installations of belt conveyors were made during the year for moving ore out of the open-pits, to rail loading points, or to treatment plants. There are now 13 such installations in Minnesota. At one beneficiating operation, soon to be opened, the ore, after crushing in the pit, is to be pumped in suspension to the concentrating plant. A considerable number of new mines are being opened in the district—including several underground properties—to replace declining output of older mines, including some of the largest. Mining of "bog-ore"—limonite—in the Spring Valley area of southeastern Minnesota was resumed in 1947, having been inactive since the 1942-1943 operations. Production is to be expanded in 1948. The washed product moves all-rail to Granite City, Ill.

Improvements in methods and equipment for underground mining are receiving greater attention than ever before, as the time approaches when underground reserves must bear a larger share of the burden of production. Both engineers and operating men have been scrutinizing the developments in mechanization of coal mines, which have made such great strides in recent years, with the idea of seeing what adaptations of underground coal-mining machinery and transportation facilities can be made to iron-ore mines. The manufacturers of such equipment obviously are alert to their task of developing machines to further replace hand labor to the maximum extent in underground mining, in order to speed production, expedite haulage, and otherwise improve over-all output per man at reduced unit costs. Greater productivity and lower unit costs are a "must," in order to attempt to keep abreast of all the rising costs the industry continues to face.

Plant expansion, new plants, and

improvements in methods and machinery for concentration of the intermediate type iron ores have marked the past year, as most recent years. Such operations already supply nearly 25 per cent of the output from Minnesota. Recovery of values from fine-grained material requiring grinding and from fine sizes in the wash ores has been adding to the output of concentrate from beneficiation plants, but recovery of much of this material is still a real problem. Although flotation has not yet found practical application in these plants, with development of cheaper reagents and of processes for agglomerating such fine concentrates, this important and widely-used process may find application in this industry before many years. Research on numerous problems of iron ore beneficiation—including agglomeration—continues vigorously in the laboratories of the various mining companies, equipment companies, some universities, state and federal mining bureaus, and at Battelle Memorial Institute. New laboratories for ore-dressing research added in 1947 include that of the M. A. Hanna Co., at Hibbing, Minn., and the Jones & Laughlin laboratory at Negaunee, Mich.

Taconite Pilot Plants

Realization of the concentration of taconite ores of the magnetic type approaches with the construction of the first pilot plant for this purpose, started in the past summer and expected to be put into operation in 1948. Located in the eastern Mesabi area, and with a capacity of about 200,000 tons of product annually, it will provide the first proving ground for the results of laboratory investigations which have been in progress for several years. Another much larger taconite plant, to be located on the north shore of Lake Superior, is in the stage of advanced planning and seems likely to materialize within a few years at most. This is the next step by the industry in the important undertaking of making ore out of iron-bearing rock. It is anticipated that taconite concentrate will gradually supplement the supply of other Lake Superior ores within a relatively few years, and, with expanding output, will greatly prolong the life of the present-type reserves. On the basis of past experience, such reserves, in turn, will be augmented by substantial new discoveries, extensions of existing orebodies, and by technological developments which may bring above the economic margin certain ores which previously could not have been mined economically.

Raw Material Supply Must Be Viewed Realistically

The public alarm which arose from varied sources in recent years, as to an imminent shortage of iron ore in this country, seems to be considerably allayed by the more realistic consideration of facts showing that decline in reserves is not to be measured by production—year by year. This does not mean, however, that the industry itself is in anywise apathetic to the important problems of insuring an adequate, continuing supply of ore. And for some companies, the situation is more urgent than for others, as would be expected. The executives of this industry are well aware of these problems, and are proceeding with the engineering and other work necessary to solve them, in the manner typical of American business enterprise. The furnace-plant expansions previously referred to are evidence that iron and steel makers, dependent on Lake Superior ore, are not on the move to new locations.

With respect to the future, iron ore supply needs to be kept in perspective with the situation relating to the supply of many other raw materials essential to our national economy. As to various other mineral raw materials, we are also entering an era in which domestic supplies must be extracted from increasingly lower grade ores than were available in the past. Also, high grade ores of other countries, particularly in the western hemisphere, may be drawn upon to a greater extent for supplementary supplies to help meet part of the expanding demands of our country. Hence, some new plants to use such import ores may be expected to develop near the seaboards, as additional capacity becomes necessary.

In addition to the extensive efforts being devoted by most of the principal Lake Superior operators to the taconite problem, no stones are being left unturned to discover and develop new iron ore deposits—both within the United States and elsewhere—which might advantageously supplement the existing sources of supply. Leasing and exploration by drilling and otherwise has been notably active during the past year in the Lake Superior region, stimulated to a considerable degree in Michigan by a wise act of the Legislature exempting new discoveries from taxation for ten years or until production begins.

Supplementing aerial magnetic work previously done in Michigan, a comprehensive survey of this type was made in Minnesota during the past season and is expected to be useful in connection with exploration there.

In Ontario, the Gunflint range, the Atikokan area which includes the Steep Rock mine, the Michipicoten district and other areas have been under renewed scrutiny by Lake Superior mining companies. Important new

developments in the Michipicoten area portend substantially increased production there in the coming years. Farther afield, the most notable searches are those which have been continued in the Labrador peninsula, and also in a large area in Venezuela adjacent to the ore deposits at El Pao already being prepared for operation by American steel interests. Results of these explorations are reported as highly promising, but their total potentialities are yet to be measured. Some hasty enthusiasts, unconnected with the industry, already see the Lake Superior district largely giving way in the near future to these and other foreign sources of iron ore, including Brazil, and they count many millions of tons of ore coming from foreign mines through a St. Lawrence seaway within a few years—if it is built. However, recent discussion with many Lake Superior operators, and consideration of their long-range plans, reveal no indications that they doubt their ability to continue to supply the furnaces, dependent on them, with good "feed" for a long time to come.

The immediate problem of Lake Superior ore reserves less concerns the over-all total tonnage available than the potential rate of annual output in the near ensuing years. Development work fell far behind in recent years, hence the current great activity in stripping new pits and in underground preparations for mining. The industry obviously is trying to anticipate whatever demands for ore may develop and to be prepared to meet them.

Other Districts—Southern, Eastern and Western—Iron ore production in the southern district was active throughout the year—the output of 8.2 million tons being the highest since 1943. As usual, Alabama supplied the red hematite ores and, with Georgia, most of the brown ores. Some repairs are being made to the large government blast furnace at Gadsden, Ala., and it is expected to be placed in operation in the near future. This will mean still greater demand for ore from that area in 1948. The first "heavy-medium" concentration plant is being erected for iron ore treatment in Alabama, indicating a further step on the problem of iron-ore beneficiation there. Much laboratory work has been done on the problems of beneficiation of Alabama ores, but as yet beneficiation has only limited application. The future doubtless will see an extensive program of beneficiating large tonnages of the siliceous red ores that comprise so much of the Alabama reserves. The problem there of making suitable furnace feed out of an extremely fine-grained red hematite concentrate is analogous to that of producing a usable product from Lake Superior taconite concentrate.

Mining of limonite ore in the northeastern Texas area was resumed about mid-year, the washed product moving to the Houston furnace. In October, additional production began in the area tributary to the government-built furnace at Daingerfield, which was put into blast for the first time in November by the Lone Star Steel Co. and continues in full operation. All the Texas ore is washed or otherwise concentrated—the plant treating the ores for Daingerfield being equipped to treat both the limonite and carbonate ores of these deposits. The carbonate, of course, requires calcining, and is then mixed with the washed limonite, to produce a furnace burden of about 54 per cent iron.

In Southeast Missouri, the principal output, as usual, was hematite jig concentrate, from the Iron Mountain mine of Ozark Ore Co. The product all moved to the furnaces at Granite City, Ill. Production, up to the present, has been from the open-pit operation, but the old underground mine has been unwatered and samples from it are being tested to see if the ore can be concentrated economically.

In New York, New Jersey and Pennsylvania, iron ore operations were maintained at a high rate throughout the year. Shipments of 3.8 million tons were 1.5 million above 1946. In addition to the New York magnetite operations at Mineville, Lyon Mountain and in Lawrence County, the Tahawus titanium operation at Sanford Lake produced by-product magnetite throughout the year. Ringwood Mines, in New Jersey, a war-time Government project, finally started operation in July 1947, producing magnetite and martite concentrates. Ore reserves, on the whole, in these eastern states are indicated as substantial. However, development of additional production, mostly underground, is certain to be slow and the full potentialities of the area—particularly New York and New Jersey—will take many years to determine.

Iron ore operations in the western states, as heretofore, were mainly in Utah, Wyoming and California, with some production for miscellaneous uses from a few other states. Output of 3.7 million tons of magnetite and hematite—direct shipping ore—exceeded that of 1946 by about 1.5 million tons and was the highest of record. The furnace of Fontana, Calif., continued to receive some ore from southern California mines, including a small amount from the important deposit at Eagle Mountain, where the mine is just now being opened and a railroad being built to serve it. The rest of the Fontana requirements came from southwestern Utah, which also supplies all the Utah furnaces at Provo and Geneva and in recent years nearly half the ore for the C. F. & I. plant at Pueblo, Colo. This company opened a new mine in the Utah district in 1947; however, the Wyoming operation continues to be its largest source of ore.

Western iron ore reserves appear adequate, on the whole, for western requirements for many years, although there are some problems of grade, transportation, etc., that do not permit the utilization of those ores without technical and economic difficulties.

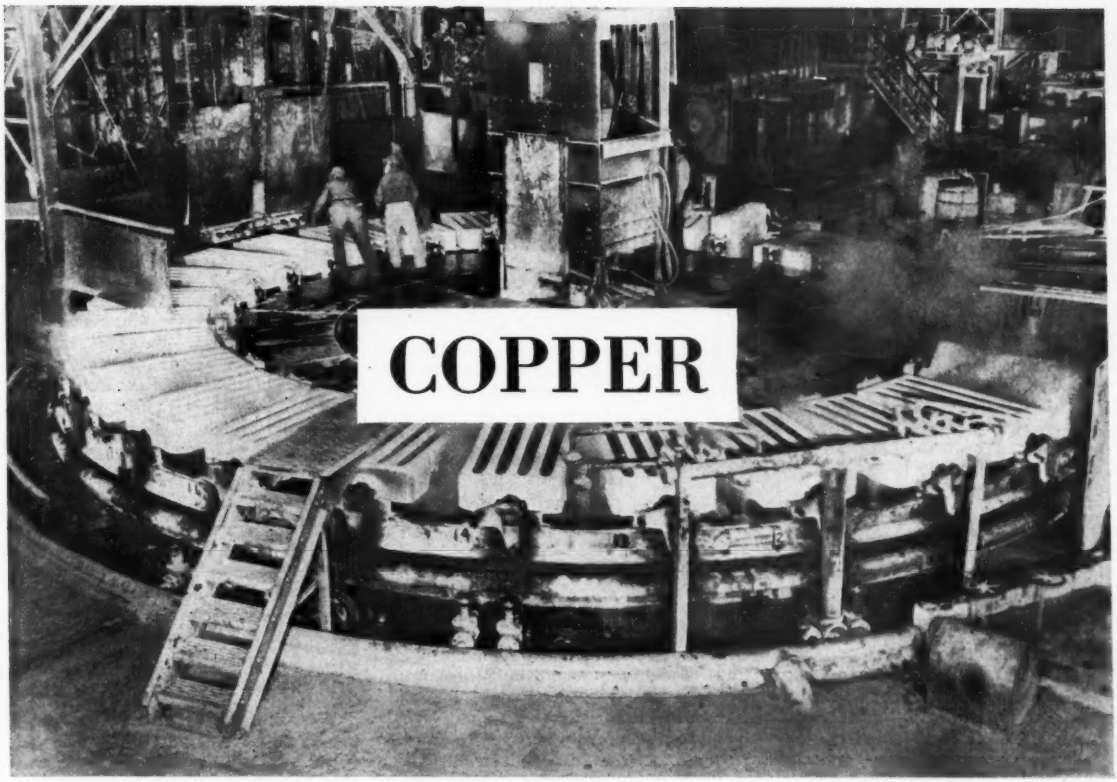
Higher Production in Year Ahead

As has been indicated above, 1948 is likely to reach a new peak in "peacetime" output and consumption of iron ore. In reality, however, the task faced by the whole iron and steel industry—as by nearly every basic industry—is essentially a continued "war" job, but now in the war against shortages of needed things and against increasing inflation, which, if unchecked, can become as disastrous as a shooting war.

The effort and intelligence which every worker in this industry now puts into his job is hardly less important to him and to the country than when he was helping produce munitions for a deadly armed conflict. Greater production, higher productivity, lower unit costs—these are the immediate, continuing challenges to both management and labor. The extent to which they may be achieved measures the progress in the current "economic warfare."

Although annual over-all requirements for iron ore in the United States appear likely to diminish somewhat when iron and steel production finally overtakes the accumulated backlog of needed things, there is no indication that the demand will ever drop back to average prewar levels. Our rapidly increasing population, coupled with the pressure for higher standards of living all over the world, is certain to long maintain a relatively high demand—from many sources—for American steel products.

Imports of iron ore in 1948, and in the future, are likely to be substantially greater than heretofore. However, from the standpoint of our national safety and economic well-being, it should be obvious that the United States cannot afford to allow itself ever to become actually dependent upon sea-borne imports for such a vital raw material as iron. There is no reason to believe that it need ever become so, if our Government, in its tax policies especially, fully recognizes the peculiar nature and risks of mining as a wasting asset industry, and removes various deterrents which penalize the industry for discovery and development of new reserves far in advance of mining. By the same token, Government should refrain from policies and undertakings which would promote greater dependence on foreign sources of iron ore at the expense of the domestic industry.



COPPER

Domestic Supply Fell Short of Demand—Unusual Price Situation Marks First Half of 1947

By JAMES DOUGLAS

Secretary
Phelps Dodge Corp.

IN order that many of the important events and trends may be better understood and their significance the more readily recognized, a brief review of the conditions existing at the turn of the year 1946-1947 would appear appropriate. Consumption (refinery deliveries) for the months of Nov. and Dec., 1946, had been 129,206 tons and 141,218 tons while the domestic mine and secondary materials contribution to the meeting of this demand had amounted to 73,024 tons and 78,674 tons for the two months, respectively. The RFC supplied the deficit, but by the year's end this agency's stocks had been drained down to 95,440 tons. It will be recalled that on Nov. 19, 1946, the RFC announced that further foreign copper purchases would be discontinued thereafter except for outstanding commitments.

At Jan. 1, 1947, the outlook for a consumption figure for the several months ahead, approaching that prevailing during the waning period of 1946, seemed assured and yet few could deny that copper from domestic sources must fall short of U. S. needs no matter how sanguine a view one might take of our industry's capabilities of expanding output. A balance of domestic supply and demand was simply not in the cards, at least for 1947 beyond which most people did not care to prophesy, it being remembered that many economists were openly predicting an industry-wide recession sometime in the latter part of the year. The RFC stocks at past rates of dispersal to consumers were expected to be exhausted by April 1 at the latest and speculation was already rife at the start of the year as to whether the Government would possess the necessary authority to release metal to industry after this date, assuming there would remain any available stocks upon which to draw.

TABLE 1—U. S. COPPER SUPPLY AND DELIVERIES, YEAR 1947

	Short tons
Primary domestic production	871,147
Secondary intake by refineries	105,190
Total of domestic origin	976,337
Plus reduction of industry and non-industry refined stocks at refineries and on consignment	29,872
Plus releases from MRC stocks	179,775
	1,185,984
Indicated net receipts of foreign copper (by deduction)	197,682
Deliveries to customers	1,383,666

And so our tripod is set up, on it the camera is mounted, the film has been threaded on the spool and is in place in preparation for the taking of a panoramic photo of 1947. Now at the end of the year as the returns are all in, there appears no clearer illustration of the principal events that the year's price curve on which it is intended to build this article complete with photographs, if you will, the principal one being that showing the daily market fluctuations both domestic and export (Fig. I). Each major price variation is an image of an important happening imprinted on the film of the year.

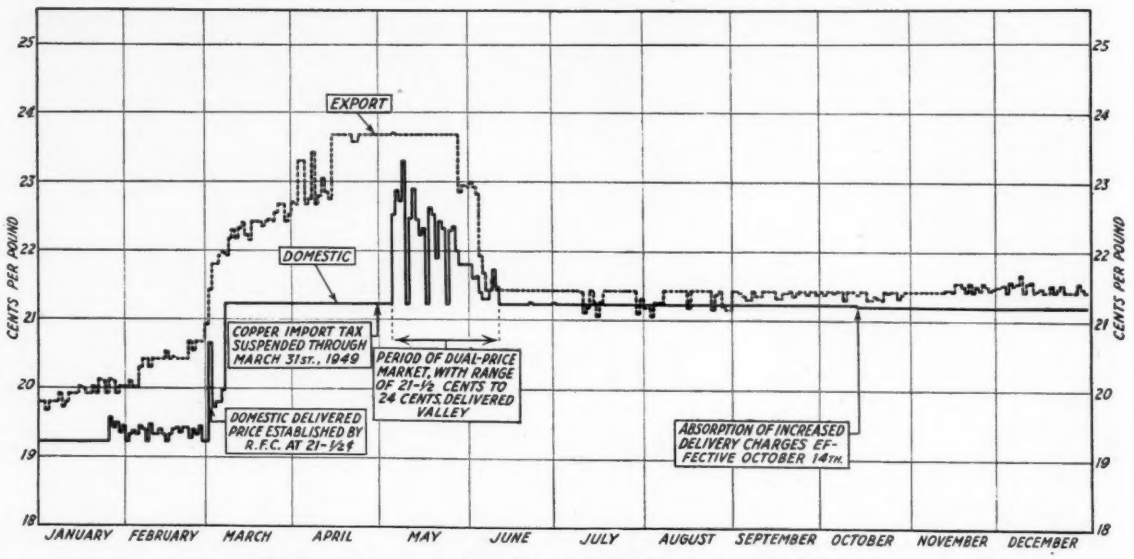


Fig. 1. Daily copper prices—1947—net at refinery or Atlantic Seaboard

Panoramic Price Changes

Our camera swings slowly through the months of Jan., Feb., March and April 1947, and the first picture, although reflecting a domestic refinery price of 19.225¢ and an export price of 19.8¢ on Jan. 2, also shows a continuing and growing concern on the part of the industry as to the future shortage of copper after the RFC stocks should become exhausted. It was plain, of course, that the deficit must come from foreign produced metal, but as time advanced and the export price continued to rise the prospect of copper for domestic consumption costing the foreign price plus the 4¢ duty led to a feeling in many quarters that the import tax should be repealed or suspended. This sentiment assumed tangible form on Feb. 3 when a bill was introduced in the House of Representatives to repeal the 4¢ per lb import tax "as an inducement to increased imports of the red metal." By this time, Feb. 3, the foreign price had climbed to 20.10¢ and the domestic level had overstepped the 19.50¢ Connecticut-Valley marker, to vary, commencing Jan. 27, between 19.50¢ and 19.85¢. This jittery domestic picture continued through February, the foreign price further advancing to 20.925¢ on March 1 (three days later on March 4 to 21.80¢), the while arguments with respect to the copper tariff question were debated in Congress.

Although on March 1, RFC stocks had dwindled to 34,360 tons and uncertainty existed as to RFC's authority to allocate copper after the end of the first quarter, this agency quite unexpectedly announced on Feb. 28 that thereafter the Government price date of delivery would be 21.50¢ Connecticut-Valley or the E & M J quotation, whichever was the higher. RFC had been previously selling its copper releases on the latter basis. Within a week thereafter the market rose to this "Government-set" level. It had been ruled that, in the future the RFC could not legally sell copper acquired subsequent to Jan. 1, 1947, at a price which did not reflect its cost of purchase plus the 4¢ import tax. Presumably, therefore, the 21.5¢ figure represent a 17.5¢ out-of-pocket cost to the RFC plus the amount of the tariff.

This Government move served to heighten the import tax battle within and without the halls of Congress where the proponents of outright repeal gave way to those arguing for suspension only for a period of time. The length of such period then became the subject of further controversy. Following hearings, the House Ways and Means Committee voted out a bill embodying a three-year waiving of the import tax to March 31, 1950. In so voting, the Committee disregarded the expressed convictions of those elements who, although agreeing that the duty should be suspended, believed that the huge consumption resulting from pent-up demands of a war-starved economy was of a more temporary nature, and that with its abatement the needs of the U. S. economy could be met from domestic output. These argued that the duty be suspended for one year only, at the end of which time a further extension could be effected if the continued need for imports were clearly indicated.

Compromise Action Suspends Import Tax

Something of a compromise was the action on the floor of the House which voted out a bill on March 12 to waive the import tax for two years up to March 31, 1949. The Senate approved the measure on April 21, amending the House action, however, by maintaining the 4¢ duty on the copper content of copper sulphate. The House agreement to the change was quickly forthcoming and on April 29 the President affixed his signature. The effect of the suspension of the import tax with respect to its facilitating the entry of foreign copper will be discussed later as our panoramic view of the year unfolds. The effect on price was immediately evident and, as we revolve our camera to "shoot" the important happenings of the next four months, we see a peculiar situation develop in this regard. Note that our "price photo" records that by May 1 the export price had gradually crept to 23.675¢ refinery, the latter being some 2.45¢ above the domestic level of 21.225¢ (21.50¢ Valley). Commencing on May 6 the market entered a period of dual prices which ranged between levels of 21.225¢ and 23.725¢ refinery, copper of foreign origin initially commanding the higher prices. Later, considerable amounts of domestic metal sold in the upper ranges. Substantial tonnages of domestic production continued to be sold at 21.225¢ (21.50¢ Valley) level, the daily E & M J quotations for domestic metal being the average of such sales on the latter basis and those disposed of domestically at or

near the export price level. This situation ended on June 12 when all domestic sales returned to a 21.225¢ refinery basis and the export price subsided to 21.425¢ refinery.

From June 12 forward to the end of the year, the price photo discloses that the domestic price remained on a flat mesa-like plane of 21.225¢ refinery (Fig. 1). During the same period, the export profile at 21.425¢ refinery was broken here and there by "gullies," the bottom elevations of which equaled or were slightly lower than the domestic level. Except for these "ravines" the height of the export line, as was the case from January to June 12, exceeded that of the domestic. About Nov. 15 the former started steepening gradually, reaching 21.675¢ early in December but sliding off to 21.425¢ refinery at the year's end.

Variable Demand Affects Price

Although the panoramic price picture of the second half does not reveal the steep and irregular contours characteristic of the first six months, there occurred certain developments which do not show up on the price film. In July, deliveries to customers fell to about 110,000 tons from previous months figures of close to 120,000 tons and lows were reached in August and September with deliveries of only 96,000 and 95,000 respectively, the lowest since April 1945 (Fig. 2). This fall-off in total deliveries was largely due to decreased demand by the brass mills, whose order books reflected the same general hesitancy displayed by the American economy during this period. Noteworthy is the fact that, in spite of this reduction in output of the brass fabricators, the "take" of the wire and cable industry continued at a high level. But for the latter, total deliveries would have fallen to an even lower level and illustrates how great was the still only partly-filled vacuum of the wire and cable needs of the nation, which failed to react as did the brass mills to the feeling of economic uncertainty of the summer months. During this period, not only had the deliveries of refined copper to the brass industry decreased but the latter's stocks had been drawn down heavily. However, as these "jittery" months ended, demand was reestablished at a high level for two reasons, to rebuild depleted inventory and to satisfy the more vigorous requirements for brass products.

Deliveries during the last quarter reached up to, but did not equal the tonnages of the first half of the year. Whether this was due to comparable less over-all demand or to the sheer unavailability of metal is conjectural. It must be noted in support of the latter alternative, however, that production, principally that from domestic mines during the last three months of the year, was lower than at any time during 1947. Mine production for the fourth quarter averaged 69,100 tons per month while the average for the nine months preceding was 73,700 tons monthly. Discontinuance of all output due to a mishap at one of the West's low-grade "porphyrys" and a two-weeks strike at part of the operations of the country's largest mine producer, entailing an estimated loss of 15,000 tons, were contributing factors in the fourth quarter to the decrease in total mine output.

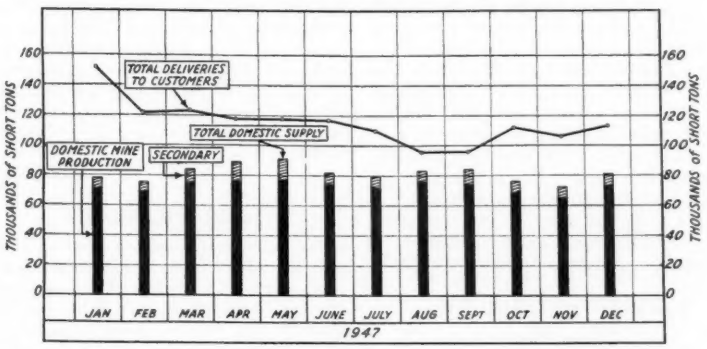


Fig. 2. U. S. copper production and deliveries to customers in 1947

Steady Effort Boosts Primary Production

The supply and consumption picture, by months during 1947, is shown in Fig. 2. What of the over-all supply and demand situation in 1947? The United States copper industry was spared the tribulations arising from the protracted work stoppages of the year before. The labor supply was in greater abundance although, generally speaking, underground operations did not benefit from return of miners as did open-pit mines. Some copper properties were obliged to suspend operations following the expiration of the Premium Price Plan the end of June and, although actual figures are unavailable, it is estimated that the loss of metal from such high-cost producers was negligible in relation to total mine output. Because, unlike 1946, there were no serious shutdowns due to strikes, mine production in 1947 scored a substantial increase over that of the previous year, the output of primary copper aggregating 871,000 tons according to the Copper Institute. This figure represented an advance of 252,000 tons or 41 per cent over the 1946 figure. In addition, the intake of secondary metal by the primary refining plants amounted to 105,000 tons, bringing the total supply in 1947 on domestic account to 976,000 tons.

Consumption in the United States during 1947, as measured by deliveries to fabricating customers, came to 1,384,000 tons according to Institute statistics. The similar figure for 1946 was 1,261 tons not including copper of foreign origin other than that imported by the Government and released to domestic users. With domestic production at 976,000 tons in 1947 it will be thus seen that, whereas in 1946 the indicated shortage of domestically produced copper to meet home requirements was nearly 610,000 tons, the deficit in 1947 was a little over 407,000 tons, the difference between the aforementioned production figure of 976,000 tons and the delivery (consumption) total of 1,384,000 tons.

Imports Supplied Bulk Of Deficits

Interesting is the manner in which the above deficit between domestically produced supply and total deliveries was satisfied in 1947. Referring to Table 2, it will be seen that, subsequent to April, Government releases were sharply reduced, tapering off to negligible amounts thereafter. Although total 1947 Government releases were 179,775 tons, of this amount 151,100 tons were disposed of during the first four months of the

TABLE 2—RELEASES OF COPPER FROM MRC STOCKS

1947	Tons
January	59,396
February	38,108
March	30,541
April	23,089
May	11,195
June	7,329
July	5,398
August	1,147
September	1,212
October	513
November	1,251
December	596
	179,775

year. A portion of the deliveries was made up by a reduction in refined stocks to the extent of almost 30,000 tons. As to imports, the largest factor in supplementing domestically derived supplies, indicated foreign receipts for producer's account were 197,682 tons. Assuming that little, if any, of this tonnage entered from abroad for domestic consumption until after the 4¢ import tax was suspended, a figure of about 24,700 tons average per month was arrived at as the quantity of foreign copper applicable to the deficit between monthly U. S. copper production and deliveries during the period May through December. That greater amounts did not flow from abroad following suspension of the duty was due to the continuing world shortage of the metal. The principal source of imports was South America and Mexico from which the U. S. might have obtained even less tonnages had not dollar shortages developed in certain consuming nations abroad.

It must be recalled that our "price photo" shows that, except in a few instances the foreign price in 1947 was in excess of the domestic level. Therefore, but for these foreign consumer-credit difficulties the relief domestic consumers did receive from foreign copper receipts might have been at least partly denied them, because a portion of such metal would have flowed naturally to the higher priced markets abroad. As long as the tight foreign situation exists, copper imports will not enter freely even under tariff suspension. However, the moment surpluses in quantities develop abroad, the need for reappraisal of the whole question of duty will be apparent.

Foreign Production Likely To Improve

Since the foreign consumption and supply situation is of paramount importance to us, a brief review of the foreign picture for the year 1947 and a guess at what may occur in the year 1948 would seem appropriate. Conditions of improved labor relations and manpower are reflected in the Canadian copper production figures. Refined output, which amounted to less than 168,000 tons in 1946, has been estimated at between 190,000 and 200,000 tons in 1947, with the prospect that a further increase to 200,000 to 220,000 tons may be realized in 1948. Consumption in Canada in 1947 has been preliminarily set at about 83,000 tons, leaving a substantial excess over local needs available for export of which Great Britain is said to have taken some 60,000 to 65,000 tons. It is anticipated that as a result of negotiations presently under way, British takings of Canadian copper in 1948 may be even greater than last year and this, together with sales to other foreign consumers and heavier domestic consumption, will probably leave no surplus of Canadian-produced copper for import into the United States.

Chilean copper production figures for 1947 are expected to record some improvement over the previous year when final returns are in. Data currently available for the first ten months show an increase of about 11 per cent in the output of bar copper as compared with the corresponding period of 1946. At that rate, copper production for all of 1947 may have approximated some 450,000 tons with little further expansion, if any, presently indicated for the current year.

The production of crude copper in Rhodesia was reported as 205,000 tons in 1946, down sharply from the war years as a result of labor difficulties as well as fuel and power shortages. The fuel shortage was extended through 1947 and the improvement in copper output was thereby held to within moderate proportions, production in that year probably rising to about 215,000 to 220,000 tons. Some betterment in available transportation facilities is anticipated for 1948 and, with an increase in coal movement to the treatment plants, a further increase in copper output is looked for.

In the Belgian Congo an insufficient supply of water to power plants is said to have been largely responsible for a drop of some 20,000 tons in the 1946 copper production to about 158,000 tons. Heavy rainfalls during the summer months are reported to have corrected that situation in 1947 and output during the latter part of the year responded accordingly. A continuation of the present satisfactory conditions should be reflected in a further moderate increase in 1948.

Foreign Surplus May Flow Here

In summary, copper production in 1946 outside the United States was 1,211,500 tons according to the American Bureau of Metal Statistics. This figure excludes Russia, Japan and Yugoslavia on which countries statistics are unavailable or fragmentary. Data presently available indicate that in 1947 this figure increased by about 11 per cent or to approximately 1,329,000 tons. Consumption in 1946 was 912,700 tons with about 930,000 tons indicated for 1947. For 1948, therefore, there will be an apparent surplus of 400,000 tons available from foreign supply for possible import into the United States. This figure should be borne in mind in the light of the following forecast of U. S. consumption and production for the year 1948.

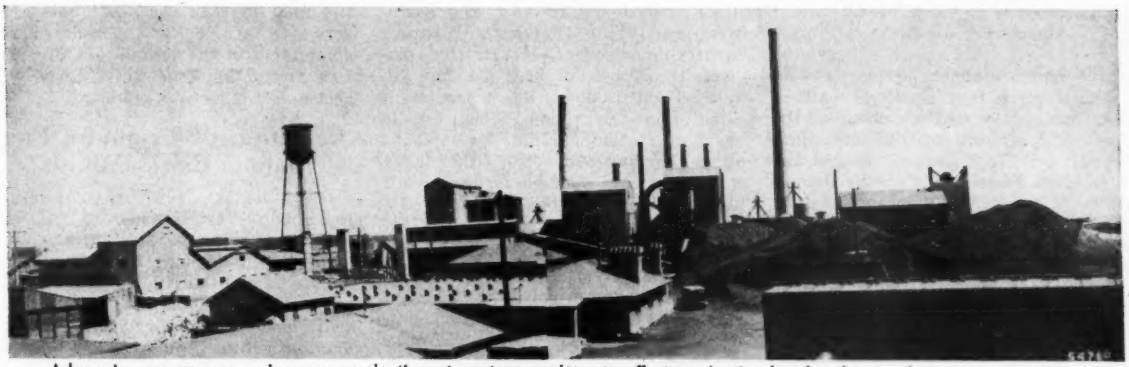
Assuming that there are no serious interruptions in mining operations in 1948 it is believed that total United States production will approach but not exceed that of the year 1947, namely 976,000 tons. On the presumption that no serious setback in general business conditions will occur, consumption should about equal the 1,384,000 ton figure of 1947. Therefore, there is indicated a deficit of approximately 400,000 tons which must be supplied from foreign sources if, under the premises, the copper needs of the U. S. economy are to be met in 1948. Already mentioned is the estimated surplus of foreign production over demand totaling some 400,000 tons against which home consumers may be able to draw. It is strikingly apparent, therefore, how delicately in balance at present is the world supply-demand picture on the basis of fairly pure statistics plus a certain amount of guesswork and a few important assumptions.

What 1948 holds for copper is in many respects as unpredictable as what the year may have in store for the United States and the world. The degree to which the European Recovery Program is enacted into legislation and the amount of the dollar credits accruing thereunder would have an influence, marked or otherwise, on the conditions. Likewise the policy which may be followed by the Government with respect to its stockpiling program is an important, though as yet uncertain, factor in the situation. Generally speaking, however, the year should be characterized by all-out efforts toward the attaining of maximum production to meet an unprecedented demand for the red metal.

"Young Man, Beware!"

An illustrated safety folder, bearing the above title, has been prepared and published by the Arizona Small Mine Operators Assn. According to Charles F. Willis, State Secretary, the folder was compiled in an effort to educate the young folks of the State concerning the dangers existing in old and abandoned mines and to teach them what to do and what not to do. The publication is illustrated with cartoons prepared by John Powers, a member of the safety department of the Anaconda Copper Mining Co. at Butte.

Last spring a tragedy occurred when three Arizona lads lost their lives while exploring the underground workings of an abandoned mine. This interesting publication is the outgrowth of that tragedy. If a boy will read the cartoons he is given the complete story of the dangers of entering mines, caves, or open pits. It is hoped that, through the cooperation of local mining companies, copies of this folder will be placed in the hands of every child from the sixth grade up. Its widespread usage and distribution should play an important part in preventing similar accidents.



Adequate manpower may increase production at western smelters to offset production lost by closure of some eastern plants

Zinc Industry Approaches Full Production

Supply Lost Due to Premium Price Plan Termination More Than Offset by Output from Other Sources

By R. A. YOUNG
Vice President
American Zinc Co. of Illinois

FOR the first time since the war, relatively full production by the zinc industry was marked in 1947. The crippling strikes of 1946 were not repeated and a material increase in both mine and smelter output resulted. The western mines continued to suffer to some degree from lack of manpower and employe housing, but conditions were not as bad as those encountered during past years. The last half of the year saw a decline in mine output in the Tri-State District after the Premium Price Plan was discontinued.

However, the Eastern and Western states continued to produce at a rate approximately equivalent to that of the first six months of 1947. The over-all production in the country was increased, and, at the end of the year, the smelters were being heavily taxed to take care of demand. Consumption of zinc in the United States remained about equal to that of 1946, but export shipments, almost twice those of the previous year, absorbed the additional smelter output. The price remained constant throughout the year although the end of the year found the industry, both in mining and smelting, hard-pressed by continually rising costs of labor, material and transportation.

Absence of Strikes Aids Mine Production

Mine production, in both semi-annual and annual periods for 1946 and 1947 is shown in Table 1. The two years have been broken down into six-month periods because the annual figures in themselves are somewhat misleading. Although the total mine output for the year 1947 increased some 61,000 tons over 1946, a substantial part of this increased production was due to the absence of strikes which had plagued the industry in 1946.

Consideration of the Eastern states' increase in production for the year 1947 over 1946 of approximately 21,000 tons reveals that the difference was due almost entirely to a strike in Tennessee during the first quarter of 1946 and one in New Jersey during the second quarter of that year. During these strikes, the state of New Jersey lost about 14,000 tons of production and Tennessee about 7000 tons. Taking this into account, the Eastern states produced at a rate of approximately 80,000 tons in each semi-annual period during the two years.

In the Central-States region a strike in the Tri-State District during the second half of 1946 accounted for a production loss of approximately 10,000 tons. Had it not occurred, the Central States as a group would have produced somewhat evenly at the rate of 86,000 tons semi-annually during 1946 and the first half of 1947. With the discontinuation of the Premium Price Plan on June 30, 1947, Tri-State production dropped precipitately and during the last half of 1947, it was some 40,000 tons under the first half of the year. By the fourth quarter production had increased over the third quarter to the extent that at year-end this region was operating at a rate of approximately 75,000 tons a year, about 50 per cent of the production rate during 1946 and the first half of 1947. The Wisconsin-Northern Illinois and the Kentucky-Southern Illinois Districts operated at about the same rate in 1947 as in 1946.

Record Production in the West

Exceeding their peak war-time year of 1944, the Western States had a banner production year in 1947. This record production was made possible by large increases in Arizona, Idaho, Utah and particularly in Montana. After a prolonged strike in Arizona during the first six months of 1947, the Copper Queen mine of Phelps-Dodge Corp. was brought to a new all-time high of output so that the state produced approximately 54,000 tons of

zinc compared to a 1940-1941 rate of approximately 16,000 tons. California, never a big ore-producing state, dropped about 50 per cent of its production in the second half of 1947 due chiefly to the closing of the zinc milling unit of the Mountain Copper Co. In Colorado, despite the closing of some smaller producing mines in July 1947, there was an increased output of zinc by the larger producers. A statewide increase of some 2000 tons resulted. At the year's end Colorado was producing zinc at the rate of almost 40,000 tons annually compared with a 1940 production of only 5000 tons. Idaho remained some 10,000 tons short of its 1944 peak, although the state increased its production approximately 10,000 tons over 1946 and at year-end was continuing to gain at a rapid rate. This accelerated production has been largely attributable to the return of a more normal supply of manpower, but new developments accounted for a sizable portion of the increase.

With the resumption of large-scale zinc mining by the Anaconda Co., Montana production increased some 31,000 tons in 1947 over 1946. During the last half of 1947, production in Montana was equivalent to the 1941 rate of approximately 53,000 tons per year.

Nevada showed about a 10 per cent decrease in the second half of 1947 under the first-half rate, but, as the new Eureka Corp. shaft is nearing completion, additional output is expected from this source by the second half of 1948.

Despite the shutdown of some mines in New Mexico after June 30, 1947, increased production by some of the larger producers succeeded in holding a production rate during the last half of the year approximately equal to that of the first half and some 10 per cent above the second half of 1946. Utah, badly crippled by strikes in the first half of 1946, furthered the gains made in the second half of 1946 in its 1947 production. Increased manpower has been almost entirely responsible for this increase.

In Washington an appreciable increase in 1947 over 1946 was attained and during the second half of 1947 production was at a rate of about 15,000 tons annually.

Development Work Resumed

For the first time since the strenuous years of the war, when emphasis was entirely upon production, most of the zinc producing mines were able to direct attention and effort to long-neglected mine development. A great deal of development was done in New York and Tennessee where work has resulted in the expansion of known reserves. Extensive development was also carried on in the Wisconsin-Northern Illinois District with rather gratifying discoveries. In this district, the Tri-State Zinc Co. has developed and is operating a successful mine, and the Eagle-Picher Co. is carrying on underground development on another new property. Other large companies have done exploration work in the area during the past year.

In the Kentucky-Southern Illinois area, a zinc-lead-fluorspar district, additional ore reserves look encouraging.

Exploration work in the Western States has resulted in new mines in Washington, Coeur d'Alene, Nevada and Arizona, and additional ore reserves have been developed in the various districts.

Zinc fuming plants located in Idaho, Montana and Utah accounted for approximately 48,000 tons of recoverable zinc production in 1947. With the new plant of the American Smelting and Refining Co. now under construction at El Paso, scheduled for completion in the second half of 1948, zinc production from this source will become even more significant.

Cessation of Premium Payments Closes Mines

On June 30, 1947, the Premium Price Plan, originated in 1942 for over-quota mine production, was terminated. Both the House and the Senate passed the Allen Bill providing for continuation of the plan for an additional two years, but President Truman vetoed it on Aug. 8, 1947. In a release dated Dec. 17, 1947, the U. S. Bureau of Mines stated that it had canvassed all mines that had closed since July 1. According to the information obtained, 58 mines that produced some zinc were closed directly or indirectly because of the expiration of subsidy payments. Of this total,

TABLE 1—U. S. MINE PRODUCTION OF RECOVERABLE ZINC IN ORE INCLUDING SLAG FUMING PLANTS, SHORT TONS
1946 AND 10 MONTHS 1947—U. S. BUREAU OF MINES DATA

	First Half 1946	Second Half 1946	First Half 1947	Second Half 1947*	Total Year 1946	Total Year 1947*
Eastern States:						
New Jersey	39,050	25,404	38,788	38,655	64,454	77,443
New York	16,355	16,160	17,066	17,099	32,515	34,165
Tennessee	8,887	15,727	16,545	14,737	24,614	31,282
Virginia	7,950	8,955	8,309	8,691	16,905	17,000
Total	72,242	66,246	80,708	79,182	138,488	159,890
Central States:						
Tri-State	74,607	64,431	74,388	34,092	139,038	108,480
Southeast Missouri	195	256	73	0	451	73
Wisconsin-Northern Illinois	9,236	9,107	8,729	8,607	18,343	17,336
Kentucky-Southern Illinois	2,198	2,846	3,038	2,634	5,044	5,672
Arkansas	.....	.....	.....	.....	85	12
Total	86,236	76,640	86,228	45,333	162,961	131,573
Western States:						
Arizona	16,375	26,990	27,395	26,500	43,365	53,895
California	4,055	3,097	4,000	2,100	7,152	6,100
Colorado	18,222	17,925	18,538	19,500	36,147	38,038
Idaho	36,650	34,857	39,925	41,900	71,507	81,825
Montana	8,385	8,385	21,150	26,600	16,770	47,750
Nevada	13,120	9,529	9,910	9,000	22,649	18,910
New Mexico	16,113	19,990	21,330	21,900	36,103	43,230
Oregon, So. Dakota, and Texas	.....	.....	.....	.....	44	50
Utah	10,940	17,352	21,850	19,000	28,292	40,850
Washington	5,995	5,334	6,110	7,500	11,329	13,610
Total	129,855	143,459	170,208	174,000	273,358	344,258
GRAND TOTAL	288,333	286,345	337,144	298,515	574,807	635,721

* November and December 1947, estimated.

TABLE 2—ZINC ORE IMPORTS (ZINC CONTENT)
(TONS OF 2000 POUNDS)
U. S. Bureau of Census

From	1943	1944	1945	1946	1947*
Argentina	53,452	19,872	0	8,295	0
Australia	120,244	42,216	15,376	3,780	864
Belgian Congo	14,835	.....	0	0	0
Bolivia	2,760	5,305	24,381	28,442	15,623
Canada	110,343	112,299	90,200	57,298	35,863
Chile	14,369	2,477	0	0	0
Italy	0	0	0	0	11,613
Mexico	166,135	177,629	177,001	127,685	139,868
Newfoundland and Labrador	32,949	19,013	23,516	0	5,100
Peru	21,901	43,889	51,242	46,555	44,575
Spain	0	0	0	0	3,321
Union of South Africa	0	0	0	0	4
Total Current Imports	536,988	422,700	381,716	272,055	256,831

* January-October preliminary.

15 mines closed in the Western States, two in the Eastern States and 41 in the Central States, 38 of these being in the Tri-State District. Production from the 58 mines averaged 4600 tons monthly in 1946 and 4800 tons monthly in 1947, of which 3720 and 3750, respectively, came from the Tri-State District.

Import Records Show New Sources

Because 1947 domestic mine production and scrap were not sufficient to supply the approximately 1,000,000 tons of recoverable zinc required by the smelters and pigment plants, imports of zinc ore were again appreciable. Table 2 shows the zinc content of concentrate imports since 1943. During 1947, imports from Mexico, Peru, Canada and Bolivia remained sizable. Australia and Argentina have practically dropped out of the U. S. supply picture because of exceedingly high transportation charges and difficulties. But dollar-short Italy and Spain, heretofore not U. S. zinc sources, shipped in small quantities during the year. Preliminary figures for 1947 indicate that total zinc content of imports into this country was approximately 300,000 tons for the year or about 30 per cent of the total U. S. requirements.

At the end of the year, an acute shortage of American railroad cars in Mexico was, at least temporarily, reducing materially the flow of concentrates from that country.

Slab Zinc Production, Shipments, and Stocks

Table 3 shows smelter production, shipments and stocks by years from 1939 through 1947 as reported by the American Zinc Institute. The smelter output of 848,000 tons in 1947 was the largest since 1944. During the year, smelter production was still hampered in some areas by manpower and housing shortages, and strikes and power shortages resulted in the loss of some smelter production. Domestic shipments were slightly under those of 1946 and the lowest since 1940. Export shipments rose to a peace-time peak of approximately 117,000 tons, and absorbed most of the smelter production in excess of domestic requirements. Stocks at producers' plants were reduced approximately 108,000 tons due entirely to shipments by the Government to its permanent stockpile which, except for rotation to prevent deterioration, cannot be used for civilian purposes. Stocks at the end of the year at producers' plants amounted to approximately 68,000 tons including Government-owned metal. As of Nov. 30, RFC stocks were 26,125 tons. This indicates that producer-owned stocks at the end of 1947 were at the lowest point for any year since 1941. Unfilled orders at the end of the year, as published by the American Zinc Institute, amounted to 59,705 tons, the highest at any year-end period since 1941.

The peace-time record of export shipments established during 1947 was brought about largely because the European smelters failed to return to pre-war levels of production. This failure is, of course, a direct result of shortages of manpower and fuel in Western Europe. It is not anticipated that these European plants can increase production appreciably over their present rate in the near future.

High costs have forcibly affected the smelting industry as demonstrated by the closing down of two eastern retort plants, one owned by the Hegler Zinc Co. at Danville, Ill., and one owned by the American Metal Co., Ltd. at Langeloth, Pa. According to the American Bureau of Metal Statistics these two plants comprised an annual capacity of 64,000 tons. Together with the closing of the United Zinc Co. at Moundsville, W. Va., a total of 86,000 tons annual smelting capacity no longer functions. On the other hand, the St. Joseph Lead Co. at Josephtown, Pa., started a substantial addition to its existing electrothermic smelter for production of both zinc metal and zinc oxide. The additional capacity of this plant is not of the magnitude of the capacity lost by the closing of the other three plants mentioned.

TABLE 3—SLAB ZINC SMELTER PRODUCTION, SHIPMENTS, AND STOCKS
AMERICAN ZINC INSTITUTE—(Tons of 2000 lb)

Year	Stock beginning	Production	SHIPMENTS				Stock ending
			Domestic	Export and drawback	Government account	Total	
1939.....	126,769	538,198	598,972	0	0	598,972	65,995
1940.....	74,262	706,100	674,615	88,165	0	762,780	17,582
1941.....	17,582	863,955	751,276	106,195	0	857,471	24,066
1942.....	24,066	929,770	733,918	151,650	0	885,568	68,268
1943.....	89,275	971,873	831,430	56,208	0	887,638	173,510
1944.....	173,510	901,332	830,334	6,988	0	837,322	237,520
1945.....	237,520	799,520	762,925	9,422	5,302	777,649	259,391
1946.....	259,391	759,346	714,292	66,638	62,007	842,937	175,800
1947.....	175,800	848,027	698,281	117,305	140,230	955,816	68,011

TABLE 4—SLAB ZINC CONSUMPTION
(Tons of 2000 lb)
(U. S. Bureau of Census)

	1943	1944	1945	1946	1947*
Galvanizing	253,201	315,991	337,181	319,189	350,000
Brass products	419,079	381,927	259,377	147,355	120,000
Zinc-brass alloys	76,325	84,521	130,836	205,353	215,000
Rolled zinc	48,529	76,524	97,589	92,294	75,000
Zinc oxide (French process)	11,496	20,198	18,113 }	26,213	25,000
Other	8,147	9,465	9,215 }		
Total U. S.	816,777	888,626	852,311	790,404	785,000

* Preliminary—September-December estimated by American Zinc Institute.

Metal Imports

Slab zinc imports into the United States, as preliminarily estimated by the Bureau of the Census for the first 10 months of 1947, amounted to approximately 59,000 tons. This was almost 50 per cent lower than the 1946 total of 105,000 tons, and the only shippers of any significance were Canada and Japan. The Japanese metal was brought into this country by the U. S. Army for sale to defray occupational costs. The metal imported from Canada was all electrolytic metal and is presumed to have been mostly special high grade metal which was in exceedingly short supply in this country during the entire year.

Metal Consumption

Table 4 shows slab zinc consumption in the United States by various uses from 1943 through 1947. The total consumption of zinc in 1947, for which the last four months has been estimated and, therefore, must be considered with some reservations, indicates a consumption approximately equal to that of 1946. The galvanizing industry continued as the principal user in 1947, and indications are that this use will almost equal the 1941 record of approximately 350,000 tons. Even so, the short supply of steel limits this industry to a point below desired output.

The brass industry, usually the second largest consumer of zinc, fell to a low usage of 120,000 tons or approximately 100,000 tons below the 1940-1941 rate. This lowest usage on record since 1938 is attributable almost entirely to the use of large tonnages of scrap returned to the market from war-time surpluses.

Zinc-base alloys, which prior to the

war consumed less than 100,000 tons annually, hit an all-time peak for the year of 215,000 tons. This usage is closely allied to the automotive and appliance industries, and their consumption of zinc in the near future will follow the rate of production of these items, although the uses for this material continue to grow at an astonishing rate.

Tariff Rates Are Cut

At the Geneva Trade Conference, which was participated in by some 23 countries, the tariff on slab zinc and zinc ore was permanently cut to the war emergency rates of .75¢ per lb of zinc content of zinc ore and .875¢ per lb of zinc metal. These rates are only 50 per cent of the tariff rates established by the Tariff Act of 1930. They had previously been in effect on a temporary basis since the Mexican Agreement of June 30, 1943. The Geneva conference had the effect of making these emergency rates permanent. Under present economic conditions and world dislocations this tariff reduction is not of particular immediate significance, but its full effect will certainly be brought home to the industry at some later date when the lower-cost mines and smelters of the other parts of the world seek to sell their surplus in the United States.

Price

Zinc price remained constant at 10.50¢ per lb for Prime Western metal fob East St. Louis, Ill. On the other hand, lead and copper prices advanced appreciably during the year. Mid Jan. 1948 saw the price increased to 12¢ per lb.

Zinc in the Future

Domestic Mine Production—With manpower shortages being rapidly overcome in the West and with an increased amount of development work being done, it is anticipated that, barring an unforeseen decline in demand or price, the domestic mine output over the United States should continue its increase started in 1947. Although it is not estimated that the Eastern or Central States will produce at a much higher rate than in the second half of 1947, practically all Western States anticipate a steadily increasing output.

Smelter Production—With further improvements of manpower in the smelters, as in the mines, and some new capacity being brought in, there should result an increase in output by certain of the smelters. It is not anticipated that this increase will do more than offset the production lost by closing of the Eastern smelters. In the Eastern retort smelters, the problem seems to be one of fighting to maintain present output in the face of ever-rising costs instead of thinking of increasing production.

Metal Consumption—As it is likely that increased steel for galvanizing operations will be available sometime during 1948, with the brass industry constantly reducing its supply of scrap and having to depend more on new zinc, and with the bright outlook for die casting consumption in the automotive and appliance field, the consumption picture for zinc looks bright. Should the recession so often forecast by many economists become a reality, this picture could, of course, change quite rapidly. However, to date there has certainly been no indication of let-up in demand from the industry's customers. On the contrary, at year-end buying pressure was growing.

LEAD

Price Increase Attracted Secondary Material. Utah and Coeur d'Alene Districts Showed Notable Increase in Production. Producers' Stocks Are Down and Lead Supply in 1948 May Fall Below 1947

By SIMON D. STRAUSS
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IN 1947 a larger quantity of lead was made available to consumers in the United States than in any previous year for which records have been kept. However, in spite of a record-breaking supply, consumers at the end of the year were clamoring for metal and the word universally applied to describe the lead situation was "shortage."

Domestic mine production of lead was approximately 375,000 tons of recoverable metal contained in ore. Although a considerable improvement over 1946, when the recoverable production of lead in ore was 332,500 tons, output was considerably less than the annual level of production during the war years, which averaged well over 400,000 tons. It was far below the peak rate of production of almost 700,000 tons attained in 1926.

Comparing output in 1946 and 1947 for the various mining regions shows that the Central States, principally southeast Missouri and Tri-State areas, produced somewhat less lead than in 1946, while the Rocky Mountain area showed a substantial increase. The drop in production of the Central States was due, in part, to the closing of a number of mines in the Tri-State area following the expiration of the Premium Price Plan, and, in part, to a reduction in the rate of operations at the St. Joseph lead properties in Missouri. The St. Joseph Lead Co. found it necessary to expand development and preparatory work in its mines in order to catch up on work that had been necessarily deferred during the period of labor shortage in the war years.

Increases in production in the Rocky Mountain area were particularly notable in Idaho and Utah. A somewhat larger labor supply enabled the operators in the Coeur d'Alene district to record an increase of over 25 per cent. In Utah the increase was better than 50 per cent, but the comparison is somewhat distorted by the fact that during 1946 the largest producer in the state, the United States Mine, was closed down for almost six months by a strike. Production in Arizona, which has been steadily increasing in recent years, established an all-time record of approximately 27,000 tons, as compared with 23,750 tons in 1946. The Phelps Dodge operations at Bisbee are now the largest producers in the state and rank among the leading five lead mines in the country.

Abandonment of Premiums Has Minor Effect

Expiration of the Premium Price Plan on mine production of lead had less effect on lead production than had been generally anticipated. On December 16 the U. S. Bureau of Mines reported that 51 mines that produce some lead had closed directly or indirectly because of the expiration of subsidy payments on June 30, 1947. Prior to their closing, these mines had produced on an average an aggregate

of 600 tons of lead monthly. Most of these mines produced zinc in addition to lead and the termination of the subsidy payments for zinc output was, for the most part, the determining factor in closing. The aggregate production lost compares with the average monthly output for the full year of about 31,000 short tons, indicating that the mines which closed accounted for about 2 per cent of the total national production.

Information in the appended tabulation of lead supplies for 1947 shows that the receipts of lead in domestic ore at smelters were actually somewhat greater than the reported mine production. This discrepancy was apparently due to shipment of stocks of concentrates accumulated during the strikes in 1946, when many of the smelters were unable to receive ore.

In addition to their current receipts of lead in ore, the smelters were able during 1947 to reduce considerably the large stocks of ore, matte and bullion which they had on hand at the beginning of the year. Those stocks had been accumulated largely because of the strike conditions in 1946. The result was that the smelter production of lead from domestic ore, including accumulated stocks, amounted to almost 440,000 tons, even though mine output was only 375,000 tons.

Price Attracts Secondary Material

Almost equal to the smelter output from domestic ore was the amount of lead (estimated at 415,000 tons) made available from the treatment of secondary material—principally battery plates. Of the secondary material, about 73,000 tons were handled at primary smelters and refineries, and the balance represented production by strictly secondary plants. This outpouring of scrap—by far the largest in the history of the industry—reflected the attraction which high prices exercised on the accumulations that generators and dealers in secondary materials had built up during the period of price control. Although statistics are not available to measure the quantity of secondary material in the hands of generators and dealers, it is the current belief in the trade that such stocks have now been reduced to a normal level.

The third source of supply for domestic consumers is lead contained in imported ores, concentrates and bullion, plus imports of refined metal. The imports of materials requiring further processing are estimated to have had a lead content of 55,000 tons in 1947, or about the same quantity as in 1946. Imports from Newfoundland and Australia were somewhat less than in 1946 but, offsetting this, a substantial amount was received

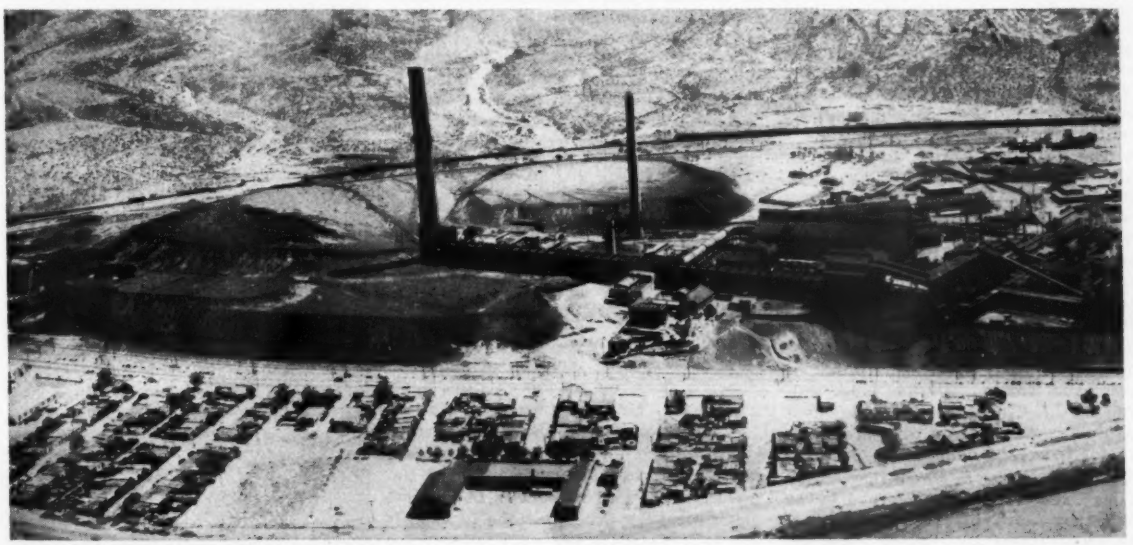
TABLE 1—LEAD SUPPLIES FOR 1947

	1945 (tons)	1946 (tons)	1947 (tons) *(estimated)*
Receipts of lead in domestic ore	387,733	332,876	402,000
Receipts of lead in foreign ore	90,776	54,848	55,000
Receipts of lead in scrap	68,860	46,892	73,000
Totals received at smelters	547,369	434,616	530,000
Change in stocks of ore, matte, and bullion, at smelters and refineries	+12,465	+23,112	−35,000
U. S. primary refinery output	524,328	413,903	585,000
Change in stock of refined lead at refineries	+25,210	+4,342	−20,000
Shipments from refineries	500,003	411,433	610,000
Production by secondary plants	242,000	295,900	342,000
Imports of refined metal	255,200	116,248	150,000
Total shipments marketable lead	997,203	823,581	1,102,000

TABLE 2—STOCKS OF LEAD AND LEAD-BEARING MATERIALS

	Dec. 31, 1946 (tons)	Dec. 31, 1947 (tons) *(estimated)*
In ore and matte and in process at smelters	111,836	75,000
In base bullion at smelters and refineries	8,453	8,500
In base bullion in transit to refineries	4,911	5,000
In process at refineries	16,042	16,000
Refined pig lead at refineries	41,057	20,000
Antimonial pig lead at refineries	7,442	9,000

Based on American Bureau of Metal Statistics.
All these figures are based on recoverable lead content.
An incomplete report of manufacturers' stocks indicates that during 1947 these increased slightly—perhaps 15,000 tons.



Zinc fuming unit will be added to the El Paso smelter to recover metal from slag

from Southwest Africa, which promises to become an important source of lead in future years.

Imports of refined metal were approximately 150,000 tons, a substantial increase over 1946. Mexico alone accounted for over half of the total, with Canada responsible for approximately 35 per cent. The balance represents small imports from Korea (representing stocks taken over by the Allied Command), Australia and Peru.

Lead Use Increased

Lead actually shipped to consumers amounted to 1,102,000 tons. Although the breakdown of use is not as yet available, this figure compares with the previous maximum of 1,100,000 tons in 1943. The previous maximum peacetime use was attained in 1946, when 925,000 tons were consumed.

All of the principal lead-consuming industries took advantage of these larger supplies to increase their use of the metal. The increase was particularly marked in the case of the battery trade supplying batteries both for new automobiles and for replacement use, as well as for various types of industrial batteries. In October and November the rate of production of automobile replacement batteries alone exceeded 2,800,000 units a month, or at the rate of about 34,000,000 batteries a year. Since this is a larger number of batteries than the total number of vehicles now in use in the country, it is obvious that this rate cannot be maintained indefinitely.

Strikes at the plants of the Western Electric Co., principal supplier of cable for the telephone industry, temporarily reduced consumption of lead for telephone cable. However, in spite of reduced shipments of lead for this purpose during the second and third quarters, the total use of lead for cable covering during 1947 is estimated at 145,000 tons as compared with 111,000 tons for 1946. Development of aluminum cable coverings was continued during the year and a fairly substantial use of aluminum for this purpose is expected in 1948. Despite the use of this supplementary material, the construction programs of the utilities and telephone companies are such that, if available, a much larger quantity of lead could be used in the cable industry in 1948 than in 1947.

In the high-test gasoline industry, the record-breaking consumption of motor fuel led to a similar large volume in the use of lead for high-test gasoline. Here again the prospects are for increased demand in 1948.

Among the uses in which the volume of lead requirements today are lower than they were in the pre-war era, the most important is the pigment field. Due to the shortage of lead and the availability of certain competitive materials, paint makers generally have revised their formulas for the production of pigments. Although lead continues to be considered the highest quality pigment material for exterior painting, the prospects are that volumes in this field will not reattain previous peak levels.

When the year 1947 began, the price of lead already stood at an all-time record level in the United States market of 12.55 cents per lb, delivered New York. However, insistent demand and the rising prices in world markets forced the domestic price upward in three successive steps—to 13 cents on January 7, to 14 cents on February 25, and to 15 cents on March 3. These advances were necessary in order to bring foreign refined lead to this market. In other words, unless domestic consumers paid roughly the equivalent of the world price plus the United States import duty, all the available production of refined lead outside the United States would have been marketed elsewhere. After March 3 the price remained unchanged for the balance of the year and, as the year ended, appeared impressively firm.

Less Lead Likely in 1948

Regarding prospects for 1948, the sketchy comments made herein with regard to consumption indicate that, barring an unexpectedly severe relapse in the general level of industrial activity in the United States, the demand for lead will be well maintained. The trend of the market for 1948 would appear to depend on the extent to which supply will be available to satisfy this demand.

Even allowing for some increase in domestic mine production in 1948, the actual smelter output of lead from domestic-mined material is bound to be lower than in 1947, since the accumulated stocks of ores in concentrates have been reduced close to normal. Similarly, it does not appear probable that the volume of secondary production in 1948 can be as great as in 1947, when, undoubtedly, much accumulated material appeared on the market. The level of probable secondary production in 1948 has been variously estimated at from 360,000 to 400,000 tons. Also, refinery stocks of refined lead, which were reduced sharply during 1947, cannot again be reduced.

Prospects for imports of lead in foreign ores, or in concentrates and bullion, indicate that no great change is to be expected in these categories. The volume of imports of refined metal may be somewhat affected by the decision with respect to the European recovery program (the Marshall Plan). If dollars are not available in Europe, the producers of lead in Canada, Mexico and Peru who sell their products for dollars, may be disposed to ship a larger tonnage into the United States market. However, it should be borne in mind that whereas lead consumption in the United States is far above pre-war peacetime levels, consumption in most other countries is well below pre-war rates and it is doubtful that it can be reduced much further without a serious breakdown in their economies. In other words, even if the Marshall European recovery program is greatly curtailed, so long as any dollars are available, it is probable that lead will be accorded a relatively high position in the list of priority imports to be paid for in dollars.

Considering the foregoing statement, imports of refined metal in 1948 probably will not vary greatly from those in 1947. Although additional lead production is being developed in Southwest Africa, Morocco and Burma, the total volume of production outside the United States in 1948 is not now expected to be materially greater than in 1947.

In summary, therefore, it does seem probable that supplies of lead available for shipment to United States' consumers in 1948 will not be as great as in 1947.

Desilverizing kettle in operation

Anthracite

Production High, the Industry Looks for Increased Demand in the Future

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★

OPERATORS, miners and users of anthracite enjoyed a prosperous year throughout 1947. A strong market, both domestic and foreign, permitted "unlimited" operation. There were no industry-wide suspensions, notwithstanding the fact that a new wage contract was negotiated. The only interruptions to continuous operation were the nine days' miners' vacation-with-pay, the temporary shutdowns at some collieries due to grievances and the failing of men to report for work when, according to contract, work was scheduled, spotty railroad car shortages and heavy rains causing some local flood conditions. It is estimated that the average working time was 270.9 days, a figure which exceeds by 90.9 days, or 50.5 per cent, the average of the three years preceding World War II. And, during this heavy demand, the market was amply supplied with hard coal. In fact, the anthracite industry was able, just as during the war period, to supply hard coal to households, apartments and factories which were suffering from the lack of oil and gas and could switch to coal.

Comparative Statistics Show Decline in Production

As estimated by the Anthracite Committee, the statistics for the year are given in the following tabulation. Tonnage figures are close to what the final official figures will show.

Research Organizations Cooperate to Further Anthracite Interests

One of the most encouraging accomplishments in 1947 was the impetus given to anthracite research and public relations by the coordination of the investigations being conducted by all interested agencies. Not only have all past and present data been made mutually available, but all future studies are being programmed to fit into an integrated whole. The direct result of this planning has led to a recognition of the need for much additional research and has already obtained greatly expanded facilities for this work.

Anthracite Institute, with all re-

Years	Commercial production, all sizes (millions of tons)	Total Men employed (thousands)	Industry production per day (thousands of tons)	Weighted average days worked	Lb. colliery fuel per ton of production	Per cent Pea and larger	Per cent Buck, Rice, Barley	Per cent No. 4 and larger	Per cent from underground	Per cent from stripping and bank	Production per producing employe per day	Production per total employe per day
1924.....	....	....	....	....	....	73.0	25.7	1.3	....	....	....	....
1939.....	48.3	92.6	264.	183	100	....	....	....	83.9	16.1	....	....
1940.....	48.2	90.8	259.	186	93	64.1	32.4	3.5	81.7	18.3	....	....
1941.....	52.6	87.5	259.	203	86	62.9	33.2	3.9	79.8	20.2	4.69	2.65
1942.....	56.6	81.6	231.	245.1	83	62.4	33.0	4.6	76.3	23.7	4.51	2.55
1943.....	56.8	78.6	206.	275.4	83	61.2	33.4	5.4	71.7	28.3	4.37	2.42
1944.....	59.9	77.0	199.	300.6	74	60.8	33.7	5.5	66.6	33.4	4.41	2.45
1045.....	51.4	72.2	188.	273.0	79	60.4	32.6	7.0	64.6	35.4	4.38	2.37
1946.....	57.3	77.4	207.	277.2	66	59.9	31.5	8.6	63.8	36.2	4.40	2.44
1947.....	54.2	74.6	200.	270.9	68	58.6	30.9	10.5	66.5	33.5	4.30	2.38

search, public relations and special activities stemming from its new headquarters and laboratory at Wilkes-Barre, Pa., has been doing noteworthy work. At nearly every meeting, conference or Government hearing a representative of the Institute gave testimony or expert advice on anthracite. Basic research designed not only to retain but also to expand the market for hard coal, compilation of current statistics on all phases of the industry and advice on the installation, operation and maintenance of all types of equipment using hard coal for space-heating and many other activities were carried on by the Anthracite Institute.

Anthracite research has been conducted for the past eight years by the School of Mineral Industries of the Pennsylvania State College. Last year an appropriation of $500,000 was made and architectural plans were completed for a new laboratory building which will greatly facilitate this work. Current studies include:

(1) Physics and chemistry of combustion reactions
(2) Flow of gases through beds of anthracite
(3) Use of anthracite as cupola fuel
(4) Beneficiation and utilization of silt
(5) Manufacture of fuel and synthesis gas
(6) Oxygen with rice and barley to produce synthesis gas

The United States Bureau of Mines in 1943 established the Anthracite Mining Section and the Anthracite Flood Control Section with headquarters in Wilkes-Barre, Pa. Additional studies in preparation and utilization were conducted in 1947 in collaboration with the research staffs of other existing agencies. Probably the most important move made by the Bureau last year was to conclude negotiations and formulate a program for future research to become effective as soon as the $500,000 Government laboratory is completed at Schuylkill Haven, Pa., immediately south of the southern outcrop of the anthracite coal beds. It is planned that much needed research in methods and machines for work at the "face" will stem from this new laboratory.

Inspections and advice in the matter of safety for life and property were continued by the Pennsylvania Department of Mines. New legislation required a considerable expansion in this department's personnel. During the year there were many problems which arose and received in their solution the active assistance of the secretary of the department.

Direction of the Production Control Plan for the anthracite industry was continued by the Anthracite Committee. It collected vital operating statistics; allocated weekly production; sampled and analyzed the quality of the production shipped from all "cooperating" producers; assumed its share of responsibility in making effective the new "Standard Anthracite" law; reported weekly on "bootleg" activity; and rendered assistance and advice on many problems of the industry.

Many individual operating companies applied prior research results to plant scale operation. Successful applications include briquetting plants, fines flotation plants, recovery of boiler fuel from silt cleaned in Humphreys spiral concentrators, and the beneficiation and pelletizing of fines.

In addition to the practice of paying $1000 to the family of each United Mine Workers of America member who loses his life in the mines the Anthracite Health and Welfare Fund has made available $500,000 for the next five years for the hospitalization and treatment of members afflicted with anthrasilicosis. The program is functioning favorably with patients from the three hard coal districts now under observation and treatment by the Jefferson Medical College.

New Laws Require Consideration of Industry

Several new laws affecting anthracite were enacted by the 1947 session of the Pennsylvania Legislature, and all are now in force. Because of their important bearing on this industry, a brief summary of each is given.

Anthracite Standards Act

In the past, more than 90 per cent of the anthracite shipped to market has conformed to the specifications of the new Standards Act. It was because some of the remaining 10 per cent was so much substandard that the new law was enacted and became effective September 1, 1947.

This new law does not prevent the shipment of substandard coal to market. But it does give to the buyer the assurance that if requested he will receive "Standard Anthracite." Already the bulk of the industry has made contracts with the Anthracite Committee to label their product as "Standard Anthracite" by affixing to their invoices the copyright seal. The penalty for shipping substandard coal bearing this label is fine or imprisonment.

Small Mines Act

On September 1, 1947, the Small Mines Act became effective and required mine inspectors every six months to enter, inspect, and determine the conditions of safety in all mines where not less than two and not more than four men are at work. Previously, the state mining laws were applied only to mines at which five or more men were at work.

As directed by the new Act, the Secretary of Mines selected from the mining laws certain regulations which he promulgated on August 27 as the code applicable to the small mines. He also appointed two additional mine inspectors for the Schuylkill Region where most of the small mines are located.

Failure of an operator of a small mine to correct unsafe conditions as ordered by a mine inspector will lead to fine or imprisonment.

Anthracite Strip Mining Law

As of September 1, 1947, permits must be obtained from the Department of Mines by all persons or corporations engaged in strip mining. The application for a permit must be accompanied by a license fee of $25 per acre to be stripped in the year ahead (minimum license $100), and by a bond of $200 per acre for the same acreage (minimum bond $2000) to secure compliance with the terms of the Act. This fee is not recoverable, but the bond is recoverable if the provisions of the Act have been met within one year after the completion of the operation.

In the conduct of stripping the Act requires that the operator backfill to 75 ft. from the center of any highway, 200 ft. from any building, and sufficient to cover any exposed coal bed. Operators must level or round-off all peaks and ridges and must either plant trees, shrubs, grasses, etc., on the spoil banks and backfillings, or employ the Department of Forests and Waters to do this planting upon the payment of $60 per acre.

Coal Mine Sealing Act

This Act, approved June 30, 1947, requires that any operator who abandons a coal mine shall have sealed, within six months, all shafts, slopes, drifts, and tunnels leading from the mine to the surface through which water may flow into any streams of this Commonwealth, and through which appreciable quantities of air may enter the mine. The location and nature of the seals must be in accordance with plans approved by the Department of Mines.

A sum of money was appropriated to this department for sealing all mines abandoned prior to the effective date of this Act where the last operator is not now in possession of the property, and maintaining all seals after their original construction.

Fines and imprisonment are the penalties for destruction of any seal without approval by the department, and failure of any operator to seal openings after abandoning a mine.

New Tax Law

According to an Act of the last General Assembly, a school district or other governing body may levy taxes on anything not already taxed by the state. The State Supreme Court has upheld the constitutionality of this Act. Toward the end of 1947, two township school boards started to take advantage of this law by making arrangements to tax coal mined or stripped from lands on which the taxes are in arrears. There may be important developments from this Act in the near future.

Anthracite Competes with Oil and Gas

In spite of the present anthracite prosperity, there are some adverse trends which lurk in the background and are receiving the attention of the research agencies.

In the first place, the anthracite industry, in which the payment to labor represents 70 per cent of the total cost of production, is in keen competition with two so-called "laborless" industries, oil and gas. It is a serious matter when increases granted to labor are followed by a drop in production per man per day.

During the first nine months of 1947, the production per miner per day dropped 2.3 per cent below that of 1946, and this latter figure was 6.2 per cent below 1941. The seriousness of this situation will not be corrected merely by laying the blame for the present high cost of a ton of anthracite on labor alone. It is a characteristic of labor today, in all industries both here and abroad, to demand higher wages for less physical toil.

A more positive correction can be found in devising methods and machines which will permit labor to increase production at less physical exertion. The anthracite production per employe now stands at 2.38 tons per day, including coal from mines and from low-labor strippings and banks. In comparison, the average mine employe in soft coal, exclusive of stripping operations, produces at more than double that figure, and some of the most modern bituminous mines show a rate per day five or six times better than anthracite.

One of the most important goals toward which anthracite's research program should be directed in the immediate future is in the development of layouts, methods, and machines for the purpose of substituting power for brawn in all face operations, particularly in areas where the beds of coal are pitching.

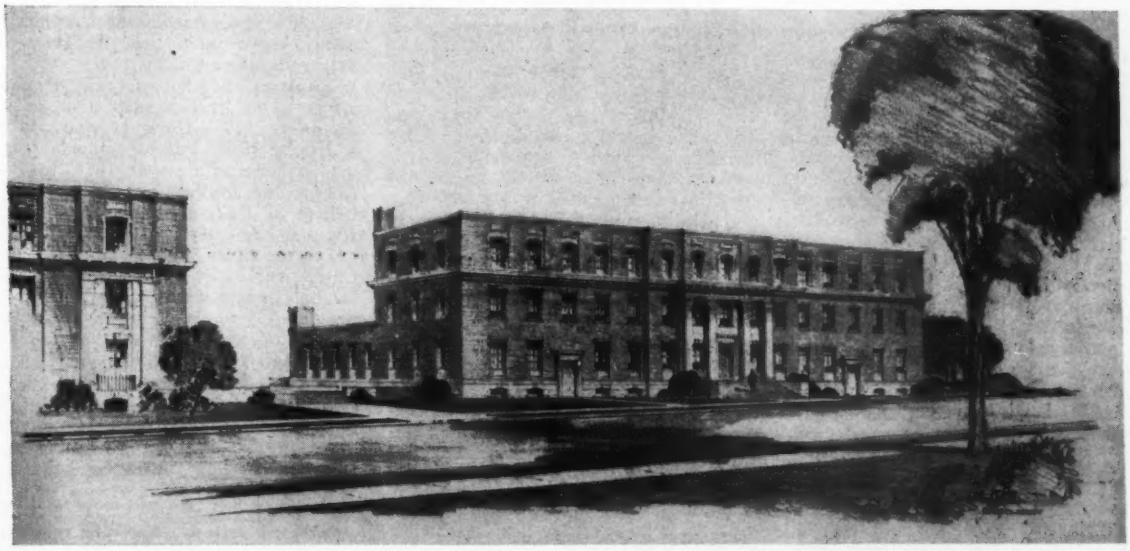
Automatic Combustion Equipment Is Wanted

In the second place, a section of the public throughout anthracite's marketing area has indicated definitely that it wants, and is willing to pay for, complete push-button space-heating without any need for hauling fuel-tonnage in and ash-tonnage out. This public insistence has been so great that it has already outstripped the ability of both the oil and the gas industries to supply sufficient fuel to take care of present minimum requirements. The law of scarcity in the matter of supply and demand has put the cost of these two competitive fuels above that of anthracite as of today. But when tankers and steel for pipes become available, a price drop in these two laborless fuels may be expected.

During 1947 the entire anthracite industry, in cooperation with associated interests, has been attempting to block the further inroads of gas and oil into the hard coal marketing area. This endeavor should be pushed with all possible intensity; not with the idea that it will be ultimately successful — for we cannot legislate against public convenience—but that it will provide time for research to develop a method for turning a portion of the anthracite production into a wholly push-button gaseous fuel.

Already studies in the use of the small buckwheat sizes of hard coal, processed with oxygen in the place of air, have indicated that the manufacture of a cheap synthesis gas is feasible. Today, some of the five sizes of buckwheat are a continual drug on the market, and are sold at 24 per cent to 72 per cent below the cost of producing an average ton of anthracite. The problem before the chemists is to design a retort mechanism in which a portion of this presently-in-excess buckwheat could be combined with the large amount of bone, daily discarded to the refuse banks—estimated at 5 to 7 per cent of the breaker input—in order to manufacture a synthesis gas capable of competing with natural gas.

Anthracite is a wonderful space-heating fuel. It is safe, smokeless, and satisfactory for most homes which are owned by persons in the medium to low income brackets. Now that stokers, thermostats, and the new anthratubes have been proven efficient, the bulk of future production will continue to go to this individual-plant market. However, even to retain this market, the rising price of coal must be controlled.



New Mineral Sciences Building to be built at Pennsylvania State College will house research facilities

— SILVER —

By HON. PAT McCARRAN

U. S. Senator from Nevada

IT is difficult to understand how the proponents of managed currency can derive any comfort from the monetary chaos prevalent today in most countries of the world, particularly China and Greece.

The world is torn between the dictates of one-man governments and those of democratic management by the people, who are striving valiantly to avoid the pitfalls of totalitarian rule. Silver and gold as money will fall into disuse if the world goes totalitarian, but these precious metals are needed and should be used extensively by the liberty-loving peoples of the earth in rehabilitating their currency systems and restoring international trade. Gold and silver are instruments of democracy, while paper money (without the support of gold and silver) is a tool of totalitarianism.*

International politics has gone far beyond the limits of reason to exert pressure against the expanded use of silver as money. Unless a bimetallic standard or monometallic standards are adopted on a multilateral basis, they have little chance of functioning successfully in the facilitation of international trade and financial transactions.

Ever since Great Britain discontinued specie payments in 1797 in an effort to sever the tie between paper and precious metal coins, she has sought to deny the peoples of the Far East and Near East a stable price for silver. She has continued to sabotage silver as money and has even gone so far in that direction in the British Isles as to enact legislation about a year ago calling for the withdrawal of all silver coins from circulation in order to further deprive the man on the street of money of intrinsic value and to give him in its place a paper money and coins made of cheap nickel and copper whose shrunken purchasing power will continue to decline until their currency system is set in order.

* A mandate issued by the Council of the Ministers of the USSR and the Central Committee of the Communist Party of the Soviet Union required the exchange of (paper) money in circulation and cash in hand at the rate of one rouble in new (paper) money for 10 old roubles, effective Dec. 16, 1947, according to *The Financial Times* of Dec. 15, 1947.

Manipulation Causes Price Fluctuations

Silver has proven a source of tremendous profits for brokers, silversmiths, and international bankers, one of the greatest beneficiaries being the Bank of England, a most successful manipulator in the field of arbitrage transactions for more than a century. These institutions have exerted a strong influence over government officials in the formulation of monetary policy and so far have prevented consummation of an international agreement embracing a workable form of bimetallism, the essence of which is a stable price for silver.

Gold and silver are instruments of democracy, while paper money (without the support of gold and silver) is a tool of totalitarianism.

At the end of 1947 the world price of silver was firm and still under the control of bullion brokers and industrial consumers.

By means of the Silver bill, signed by the President on July 31, 1946, authorizing the sale of nonmonetized Treasury silver for industrial purposes at not less than 90.5¢ per oz and establishing a new Treasury buying price for newly-mined domestic silver at the same price, it was expected that a stabilizing effect would be exerted on the world price of silver. This legislation resulted in raising the world price from 71.11 to 90⅜¢ an oz on Aug. 1, 1946, where it remained until November 1946, when it began to fluctuate within a narrow range. On Dec. 19, 1946, the price broke below 87¼¢ and continued to decline until it reached 84¢ an. oz on Dec. 26, 1946, where it remained for the balance of the year. The immediate effect of the silver legislation was to tend to equate the Treasury buying price with the world price, since domestic producers were disposed to make their production available to the Treasury at the enhanced price. Of course, the influence of foreign silver coming onto the market tended to depress the world price below the established Treasury price. But the great demand for silver for industrial uses still exceeded the available supply, and this tended to keep the price up.

In a fluctuating movement the world price dropped from 90⅜¢ an oz in December 1946 to 72.3¢ in February 1947. The downward trend continued until June 1947, when a low for the year of 59¾¢ an oz was reached. This drop of a little over 30¢ an oz over an eight-months' period was due largely to the fact that silver which had been withheld from the market in anticipation of the price-rise legislation found its way onto the market in the latter part of 1946 and early part of 1947. Also, in the fall of 1946 British authorities decided to sponsor legislation designed to withdraw all silver coins from circulation ostensibly for the purpose of repaying in kind their lend-lease silver debt to the United States of 88,073,878.21 oz. England previously underwrote India's silver lend-lease debt of 225,999,903.83 oz, the two together comprising 75 per cent of the total amount of silver lend-leased during World War II.†

Knowledge of the fact that Britain was considering the withdrawal of its silver no doubt had a psychological effect on the market and the price was subsequently depressed early in 1947 when this action was taken. England had previously been a substantial silver buyer abroad for her industrial needs, which in 1947 called for 16,000,000 oz. The reverse action of becoming a potential seller was caused by discontinuance of the Bank of England's practice of supplying dollars with which to purchase silver and the sharp decline in price in the Bombay market from $1.54 to 99¢ an oz on Nov. 30, 1946. The price range of silver in the Bombay market in 1947 fluctuated from $1.16 in January to $1.51 an oz in April. At the end of 1947 the price in that market was fairly stable at $1.36 an oz.

England did not actually export silver to us in December 1946 or in January 1947. However, there was a rise in silver bullion imports from 4,747,000 oz in October 1946, to 11,571,000 oz in January 1947, which helped to depress the world price of silver in the early part of 1947. Some of these silver imports came from China, valued at $6,658,304.00. This sizable import from China was approximately 95 per cent of all silver imported from China throughout 1947.

One effect of the Indian ban on the importation of silver was to contribute substantially to the decline in the price since some silver ordinarily intended for India was diverted to the New York market. But the crowning

† So far, Britain has repaid none of her silver lend-lease debt. The best information available is that she is selling silver extracted from coins on the London market to satisfy her domestic industrial demand.

blow came during the early summer when domestic industrial consumers ceased buying silver for a period of several weeks when they were taking inventory. During this period, June 1947, the price dropped to 59¾¢ an oz.

Towards the end of July the world price began to rise once more until it reached 74⅝¢ on oz in November, at which price it remained unchanged on Dec. 31, 1947.

It is interesting to note the factors that contributed to arresting the price decline during the first six months of 1947. As the excess supply of silver increased and the price dropped to the low point of 59¾¢ in June, the Mexican Government realizing the necessity for action, wisely decided to absorb 2,000,000 oz of newly-mined Mexican silver for coinage purposes. The rate of Mexican production at that time was about 4,000,000 oz per month. This action was a major factor in arresting the price decline and stimulating its subsequent rise. The fact that such a small quantity was instrumental in reversing the price trend reveals the extreme sensitiveness of the silver market in 1947.

Almost all of our domestic production of silver since July 1, 1946, was acquired by the Treasury because the newly established price of 90.5¢ for domestic silver was above, and has remained above, the world price. During 1947 the Treasury acquired approximately 30,000,000 oz of domestically-mined silver, compared with only 4,900,000 oz during the last six months of 1946.‡

Domestic production for 1947, according to the best figures available at the time this article is written (Jan. 20, 1948), was 33,500,000 oz, compared with 21,400,000 oz in 1946, an increase of 56.5 per cent.

Industrial Use of Silver High

Compared with 105,000,000 oz in 1946, the estimated industrial consumption for 1947 of 100,000,000 oz indicates the remarkable recovery of silver manufacturing plants engaged almost exclusively during the war in the manufacture of articles and materials for war uses. The greatest amount of silver consumed in any one year for war uses was 120,000,000 oz in 1944. The back-log of orders in the hands of silversmiths, together with new business, is conservatively estimated to require five years to satisfy.

Industrial consumption for 1948, it is believed, will equal that of 1947. Although 65 per cent of manufactured silver takes the form of sterling and plated silverware, for which there is a big demand, the white metal is being used in increasing quantities in brazing alloys, film and other photographic material and in the electrical appliances field.

Imports of silver for 1947 amounted to 84,200,000 oz of which 30,300,000 oz were in the form of ore and base bullion. Refined bullion imports reached 53,900,000 oz. This compares with ore and base bullion imports of 28,700,000 oz in 1946 and refined bullion imports of 32,900,000 oz, which aggregate 61,600,000 oz for 1946.

Exports of silver for 1947 totaled 28,300,000 oz as compared to 39,800,000 oz exported in 1946.

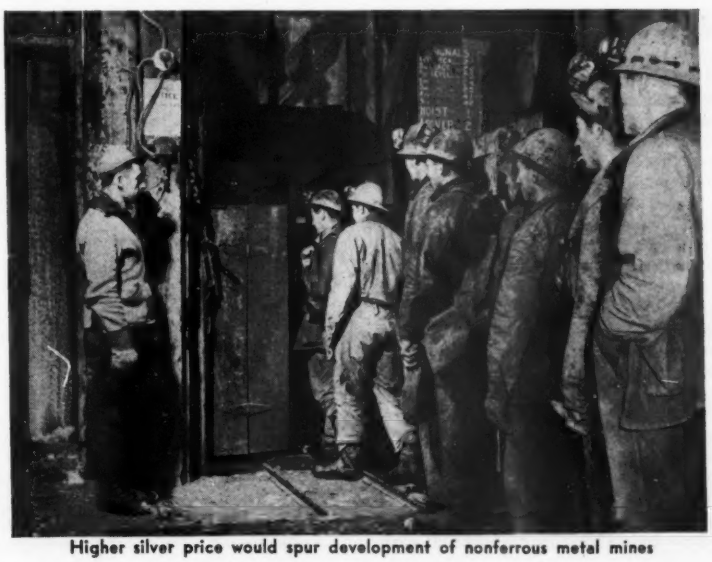
Domestic coinage in 1947 consumed 25,600,000 oz, the coinage of dimes predominating in the amount of 14,600,000 oz, compared with a total domestic coinage in 1946 of 44,000,000 oz.

Our mints, in 1947, also executed coinage for Colombia, Dominican Republic, Ecuador, Ethiopia, Panama, Philippines, Salvador, Saudi Arabia and Venezuela.

Silver Price Affects Supply of Nonferrous Metals

There has been some question about the relationship of the price of silver to the production of the base metals. It is held that shortages of copper, lead and zinc could be eliminated by paying a higher price for silver. It remained for Tom Lyon, of the International Smelting and Refining Co., Salt Lake City, to bare all angles of the subject in a most convincing manner. In an address before the Annual Metal Mining Convention in El Paso in October 1947, Mr. Lyon stated that many of our copper, lead and zinc deposits would probably have remained undeveloped if it had not been for prospecting during periods of high silver prices. Not only that, but development of these deposits was profitable only because of the silver values in the ore. Mr. Lyon presents figures to show the essential connection between the production of the base metals and silver in districts in Utah, Idaho and Nevada over a period of 75 years. He seeks to inform the states where copper, lead and zinc are consumed that a sure way to acquire more of these base metals for manufacturing purposes is to support an increased silver price. The effective price, Mr. Lyon advocates, would be the monetary value of $1.29 per oz for domestically-mined silver. If the Treasury would pay the miner $1.29 an oz for his silver and convert it into money and circulate it at the same price, it would not cost the taxpayer one cent. Silver is and always has been by law monetized and circulated as silver dollars or silver certificates at $1.29 an oz. At present the Government realizes a profit (seigniorage) of 38¢ an oz, which is the difference between the Treasury buying price of 90.5¢ an oz for silver and the monetary price of $1.29 per oz.

On this point I am in thorough accord. The only inducement needed to stimulate prospecting in our search for new ore bodies is the payment of the full monetary price for silver. The sooner our Government realizes this, the sooner we will have made available, without cost to the Government, a larger production of the base metals required in both peace and war, as well as silver and gold to support our monetary system in an expanding economy.



Higher silver price would spur development of nonferrous metal mines

‡ This comparatively small portion of the domestic production acquired by the Treasury during the latter half of 1946 is due to the fact that the Act of July 31, 1946, limited the Treasury's acquisitions to silver mined on and after July 1, 1946, and a period of from two to five months after the silver is mined is required for it to reach the mint.

The Outlook for Quicksilver

New Idria produced 40 per cent of all domestic mercury

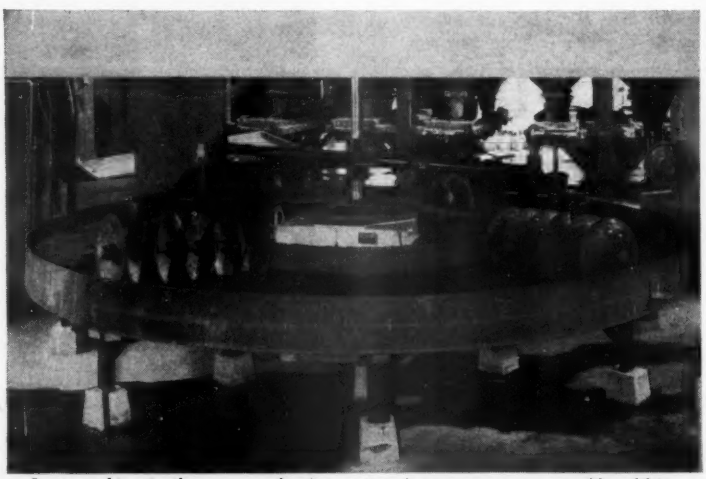
By GORDON I. GOULD
President
New Idria Quicksilver Mining Co.

A YEAR ago in these same pages, it was stated "the outlook for quicksilver in 1947 is dark." And to the quicksilver miner looking ahead into 1948 there is little that may be said now that can in any way encourage him to continue in his pursuit of the elusive metal. Perhaps there are so few quicksilver producers left that their plight is inconsequential in this disturbed world; or, maybe there are so few left that we had better take stock of our position and take steps to remedy the situation. In either case, a brief review of 1947 may help in a forecast of the future.

Production during 1947 probably came from the smallest number of mines in many years. Likewise, the bulk of the production came from only a few mines and even some of the more substantial and regular producers of previous years dropped out in 1947.

It is estimated that production for 1947 will approximate 22,850 flasks, a drop of about 10 per cent from the year before and about 26 per cent from 1945. Although this figure is about 50 per cent of the war years (1940-1944 inclusive) average, it is about 30 per cent above the average of the 5 prewar years (1935-1939 inclusive).

New Idria Mine in California continued as the largest producer at about 40 per cent of the total domestic production, which, together with the Cordero mine in Nevada, the Mount Jackson and Reed mines in California, the Bonanza mine in Oregon, and the Hermes mine in Idaho produced nearly 95 per cent of the total domestic production. During the year, two of these mines suspended operations as did several others that, although they were relatively smaller producers, had been regular producers over a period of several years. It is significant then, if not alarming, that at the end of 1947 four mines with a combined producing capacity about equal to the prewar rate of production and—as it looks now—destined to produce in 1948 at least 90 per cent of our domestic supply, are all that are left out of an average of 158 mines per year during the five war years.



Soot machine in the new condensing system increases recovery at New Idria

Imports Decrease

Other sources of supply of metal during the year include imports and salvage—the latter principally from mercury batteries. Imports, including a lot brought in by the U. S. Commercial Co. from Japan, totaled approximately 8500 flasks coming from Japan, Mexico, Yugoslavia, Italy, Spain, and Chile. This represents a decrease of 63 per cent from the previous year, 88 per cent from 1945, 54 per cent from the war years' average, and 16 per cent from the prewar years' average.

Salvage from mercury batteries, scrap, and calomel in 1947 will approximate 3000 flasks as compared with 3900 in 1946.

From the above figures it will be noted that the apparent new supply of quicksilver during the year was approximately 33,700 flasks (after exports) and that consumption was approximately 32,100 flasks. Although these figures do not seem alarming, they do not show the surplus metal accumulated in the preceding year which had to be absorbed, nor can they reflect the depressing influence on the price caused by unrestricted offerings of cartel metal by the Europeans, by the distress lots offered at "a price to get the business" by dollar-shy nations, or by offerings by government agencies awarded at well-below market prices.

After a nearly steady price decline from January, 1945, quicksilver began the year 1947 at $88 per flask—about the price at the beginning of the European war in 1939. During the year 1947, the price gradually fell to $79 at year end—below the average for 1936. With the reconstruction of the Spanish-Italian cartel in 1946, there was a degree of hopefulness, at the beginning of the year, that reasonable stability of price might prevail. But the announcement that the government had a large quantity of seized German metal and that another lot in Japan was to be offered for bids was enough threat for the cartel to reduce their price. A large lot came to this country and then the U. S. Commercial Co. sold the 2900 flasks from Japan at well-below market. Offerings of substantial quantities at year's end, from Yugoslavia and Japan and the rumor of another large lot in South America — definitely not of South American origin—added their impact to the depression of the price.

As previously pointed out the price at year end was below the average for the year 1936. Costs in quicksilver mining have followed the trend of all other costs. It is estimated that the cost of mining and treating a ton of quicksilver ore increased at least 10 per cent in 1947 and it is about double the cost of 1936. Surviving producers are only those who were able to develop higher grade ore bodies during the war years.

True Conservation Can Be Realized

High-grade ore reserves developed during the late war period, during which time the quicksilver price was such that most mines could properly explore and develop still greater reserves, are rapidly being depleted. Similarly, the present price level precludes the possibility of even normal exploration and development and has made marginal, or even unprofitable, much ore previously held in reserves. So acute has been the impact of these lower prices that only a few mines remain in production. It is difficult to estimate the loss of reserves in mines shut down but it is safe to say that many flasks of quicksilver may never be mined. Surely this is not conservation of a natural resource.

Although it is recognized that the United States normally will have to import some quicksilver to meet its requirements, it can have a healthy industry if it doesn't have to compete with cartel selling tactics, sales of excess stocks of seized metal at bargain prices, and apparent encouragement by our own government departments, of nations needing dollar credits, to bring in quicksilver. Instead, encouragement of domestic exploration and development can increase our reserves, rehabilitate an industry already in a depression relatively more severe than that of the 30's, and provide us with a degree of self-sufficiency in a metal vital to our national security, the production of 80 per cent of which is normally produced outside this hemisphere. Unless this is obtained, it can only be said that the outlook for quicksilver in 1948 is darker than it was for 1947.

New Idria miners lunch underground

U. S. Mercury Mines vs. Rich Foreign Ores

Domestic quicksilver mining from mines whose ores seldom reach a grade of one per cent face tough competition from abroad. Nearly all of the long-established mercury mines of Spain and Italy have far richer ore. The average grade of mercury ore in Almaden, Spain, is six per cent, and the Italian ores range up to two and three per cent. Almaden has reserves currently estimated as ample to assure steady production for 200 years with an annual output of 82,000 flasks of mercury.

Although the mining methods at Almaden have improved considerably in the centuries of operation, they are still far from being what would be termed "up-to-date" in this country. Despite the wasteful method of operating, the inherent virtue of high-grade ore permits low-cost production of quicksilver. Cartel pricing is based primarily on what returns may be obtained rather than upon cost.

As mining costs in the United States increase, the main hope for the continued operation of domestic mercury mines is discovery of new and higher grade ore bodies. Unless we as a nation are certain that we can depend upon foreign sources of supply, which is most unlikely, vigorous steps should be taken to insure continued operation, exploration, and development of our own quicksilver resources in order that a steady supply of mercury will be available to meet the needs of the country, both in time of peace and in a time of national emergency.

Vat of sulphur dwarfs the train that carries it to watercraft. From weightometer house the sulphur is loaded on ships

SULPHUR in 1947

By

W. W. DUECKER

and

E. W. EDDY

Texas Gulf Sulphur Co., Inc.

LIKE practically every other American industry, the American sulphur industry extended itself in 1947 to meet the domestic and the world's demand for its product. In supplying the requirements of its customers, both domestic and foreign, approximately 4,825,000 gross tons of sulphur were shipped. With production close to 4,500,000 tons, withdrawals from stocks were necessary.

Total shipments of 4,825,000 gross tons represent an increase of 27 per cent over 1946 and 130 per cent greater than the prewar, 1937-1939, yearly average. Of this total, domestic users took 3,550,000 tons—nearly two and a half times the prewar year's average, and 20 per cent more than in 1946. Export shipments of 1,275,000 tons (including Canada) were 7 per cent higher than last year but twice as great as the 1937-1939 average. Although producers' stocks at the mines decreased for the full year, during the latter part of the year production increased sufficiently not only to balance shipments but also to permit some rebuilding of stocks.

The record domestic shipments of sulphur are attributed to the requirements for sulphuric acid by the steel, rayon, and chemical industries and particularly, the fertilizer industry. The average prewar production of acid expressed as 100 per cent acid was a little more than 5,000,000 net tons a year. During the first ten months of 1947, the Bureau of Census reports the production of 8,227,000 tons of 100 per cent sulphuric acid and indications are that the total for the year will be nearly 10,000,000 net tons. The acid requirements of the country during the last 10 years, therefore, have doubled and about a third of the acid produced was used in the manufacture of the fertilizers so urgently needed both here and abroad. During the year, ten new acid plants were brought into production and capacities of many of the existing plants were expanded. Former ordnance plants at Copperhill and Cornwells Heights were producing and the plant at Tallacoosa, Ala., was leased and put back into production in the middle fo the year. The Gopher Ordnance Works contact plant was dismantled and moved to Iowa and is

expected to be in production at the end of the year. It will add materially to the quantity of acid available to the Middle West.

Foreign Sources Not Operating at Full Capacity

Pyrites continued to be an important source of sulphur for the manufacture of sulphuric acid and production of domestic pyrites in 1947 was nearly double that of the 1937-1939 period. Imports, however, have been drastically reduced, due to the unsettled conditions abroad. The Spanish, Portuguese, Norwegian, Italian, and German pyrites mines have great production capacities. These mines, as in the past, can play an important part in the future but in 1947 they operated on a restricted basis.

Another important source of sulphur used in making sulphuric acid is sulphide ores of copper and zinc. In this country, in 1947, production of acid from these ores is estimated to have increased about one-third when compared with 1946. A comparatively recent development is the utilization of hydrogen sulphide recovered from natural and coke-oven gas and petroleum refining. The Bureau of Mines reports that in 1946, 37,499 gross tons of elemental sulphur were used from these sources and, in addition, 18,366 gross tons of sulphur in the form of hydrogen sulphide were burned for the production of acid. During the year, one company started operation of a new sulphuric acid plant in New Jersey, using both hydrogen sulphide and sulphur. Increased use of hydrogen sulphide on the Pacific Coast is planned.

SULPHUR INDUSTRY IN THE UNITED STATES

	1937–39 Average	1946	1947 Estimated
LONG TONS			
Production of crude sulphur	2,408,786	3,859,642	4,450,000
Shipments of crude sulphur	2,109,725	4,128,212	4,825,000
For domestic use	1,482,317	2,939,140	3,550,000
For export	627,408	1,189,072	1,275,000
Stocks at mines end of year	4,000,000	3,200,000	2,800,000
Production of domestic pyrites	552,068	813,372	900,000
Sulphur content	221,000	338,000	380,000
Imports of pyrites	447,000	182,893	150,000
Sulphur content (a)	210,000	82,000	68,000
SHORT TONS			
Sulphuric acid from smelter gases 60° Be'	764,000	922,000	1,150,000
Equivalent sulphur	201,000	247,000	280,000
Sulphuric acid production, 100% (b)	4,700,000	8,649,163	10,000,000

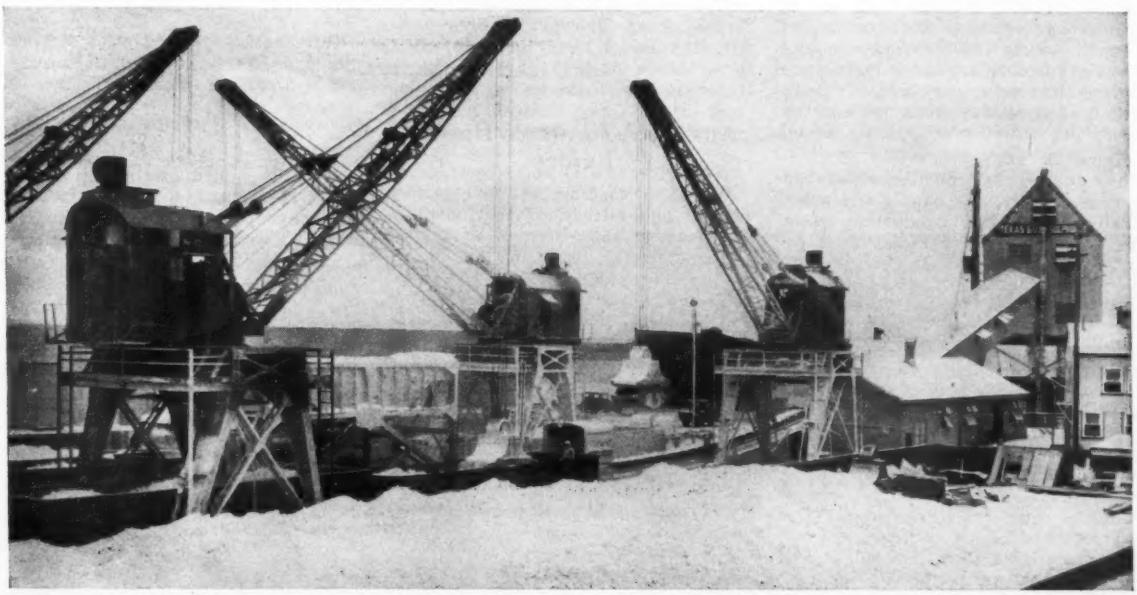
(a) Estimated at 45 per cent.
(b) New acid, not including fortified spent acid.

Abroad, the sulphur industry was faced with many problems. The Orkla smelter in Norway was the only large European producer to supply sulphur in 1947 in quantities comparable with prewar years. In Sicily, flooding of some of the mines, shortages of power, and political unrest have held back production. The Japanese sulphur industry like the Spanish pyrites mines, was hindered by shortages in fuel and power. It is impossible to predict how long these conditions which stimulate the demand for U. S. sulphur will continue.

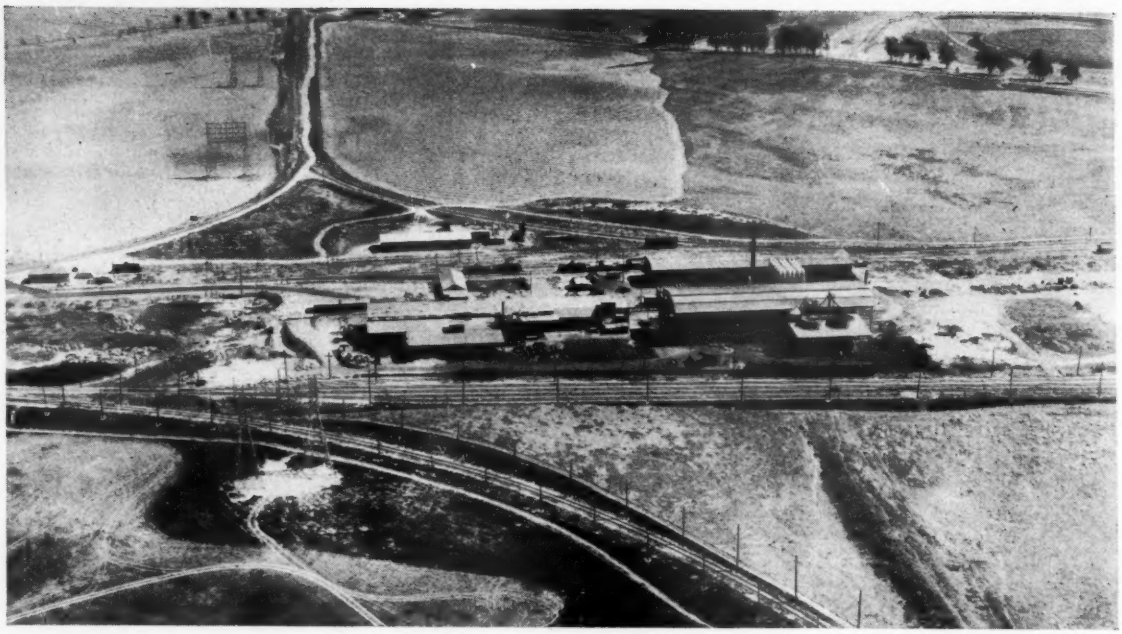
Existing Sulphur Plants Expand to Meet Demand

Under the record demand for sulphur shipping facilities were taxed to the utmost. All the sulphur producers have been actively engaged in increasing their production. The Texas Gulf Sulphur Co. increased its output at Newgulf, Tex. It is also equipping a new sulphur mining property at Moss Bluff, Tex., which should come into operation in 1948. The Freeport Sulphur Co. increased its production at the Grande Ecaille mine in Louisiana in the last quarter. The Duval Sulphur Co. continued to operate its mine at Orchard Dome, Tex., and installed additional steam boilers. The Jefferson Lake Sulphur Co. continued to operate the deposit at Clemens, Tex., as well as at Long Point, Tex., where operations are carried on in areas adjacent to territory that was mined in earlier years.

Crude sulphur continues to be one of our cheapest basic commodities. Even after loading and transportation costs are included, its cost in many plants is only about a cent a pound.



Mechanical equipment handles large tonnages of sulphur en route to market



Smelter at El Segundo, Calif., treats antimony ores

ANTIMONY

By JAMES P. BRADLEY
Vice President
Bradley Mining Co.

ANTIMONY continued to be in strong demand and insufficient supply during 1947, and the indications are that this trend will continue during the coming year with a supply deficit of about 6600 tons forecast for 1948.

Domestic mine production of antimony during 1947 contributed a large part of the available supply and practically all of this production came from one mine, the Yellow Pine Mine at Stibnite, Idaho, which shipped concentrates containing slightly over 5000 tons of antimony during the year.

Antimony mining on the present scale is a new domestic industry and many significant changes have taken place in the antimony situation since prewar years. Comparing 1947 with the yearly averages of the five-year period 1935-1939, domestic mine production has increased about seven times, imports have increased slightly and the scrap supply and domestic requirements have about doubled.

The price of antimony has had several increases since OPA ceilings were removed in November 1946. Under OPA, the price was 14½¢ per lb, fob Laredo, Tex. This price increased to 28¼¢ on Jan. 1, 1947, and to 33¢ per lb on March 15, 1947, at which figure it remained until the end of 1947.

Antimony Controls Due to Expire

War-time controls on inventories, exports and allocations continued in force during 1947. Order M-112, as amended Sept. 3, 1947, is administered by the Office of Materials Distribution, Department of Commerce. The controls were relaxed on Sept. 3, 1947, the main change being that no permission is now needed to ship antimony to domestic consumers but authorization must be had for accepting delivery. On Dec. 9, 1947, the Department of Commerce asked Congress to pass a bill extending the controls on antimony until June 30, 1949. Order M-112 expires Feb. 29, 1948, unless extended by Congress.

One advantage of the controls has been the excellent statistics prepared by the Department of Commerce, of which free use has been made in this article. Statistics on domestic consumption are not available for the years prior to 1941.

Government Stockpiling

Antimony in the large stockpile built up by the Government during the early years of World War II has been a most important source of supply for domestic consumers. On Jan. 1, 1944, the Metals Reserve stockpile amounted to 23,728 tons, but on Oct. 31, 1947, this stockpile was down to 6831 tons.

Information on the National Stockpile is, of course, confidential and cannot be discussed in this article.

Tariffs

The General Agreement on Tariffs and Trade signed at Geneva on Oct. 30, 1947 reduced the tariff rate on antimony metal and oxide from 2 cents to 1 cent per pound. This action is most discouraging to domestic antimony miners, as it indicates no desire on the part of the United States Government to encourage domestic antimony mining. To add insult to injury, the tariff on needle or liquidated antimony was reduced from one-half cent to one-quarter cent per pound.

What is really needed is more tariff protection to encourage the full exploitation of the low grade, domestic antimony deposits and the building of smelters suitable for these ores. There is no tariff on antimony ores and concentrates, which forms of antimony represent the bulk of imports.

Government actions to date have been along the lines of hindering or

TABLE I—U. S. SUPPLIES, CONSUMPTION AND STOCKS—1947*
(Short Tons Contained Antimony)

	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.[1]	Total
Supplies:					
Domestic mine production	999	1,323	1,390	1,200	4,912
Imports of ore	2,212	2,344	2,205	2,000	8,761
Imports of metal	1,711	1,104	1,147	1,500	5,462
Scrap	5,925	5,315	4,684	4,500	20,424
Total	10,847	10,086	9,426	9,200	39,559
Consumption:					
Domestic consumption	10,825	10,658	9,021	9,200	39,704
Exports	210	422	346	400	1,378
Total	11,035	11,080	9,367	9,600	41,082

Stocks:	Jan. 1, 1947	Jan. 1, 1948
Government:		
Ore	1,703	200
Metal	3,487	6,500
Private:[2]		
Ore	6,110	3,600
Metal	2,038	1,700
Oxide	2,068	2,300
Sulphide	112	100
Scrap	2,856	2,500
Total	18,374	16,900

* Source: U. S. Department of Commerce.
[1] Estimated.
[2] Largely working stocks.

TABLE II—ESTIMATED U. S. ANTIMONY SUPPLY-DEMAND 1948*
(Short Tons Contained Antimony)

New Supply:		
Domestic ore		4,800
Foreign ore		6,000
Foreign metal[1]		4,000
Total primary		14,800
Scrap		18,000
Total		32,800
Consumption and exports:		
Metallic products		28,000
Primary	10,000	
Secondary	18,000	
Chemical products:		
Flameproof compounds		400
Paints and lacquers		1,400
Frits and ceramic enamels		1,700
Other		3,500
Processing loss		2,400
Total domestic		37,400
Exports		2,000
Total		39,400
Deficit		−6,600

* Source: U. S. Department of Commerce.
[1] Entirely dependent on shipments from China.

discouraging the search for and the mining of antimony in this country. The OPA ceiling was held for many years far below the world price with no compensation in the form of premiums or subsidies to make up the difference. The lack of tariff on ores and concentrates and the reduction of the existing inadequate tariffs on oxide and metal, as mentioned above, are most discouraging.

Primary Antimony Comes from Few Sources

The four major world sources of supply are the state of Idaho and the countries of Bolivia, Mexico and China. The Chinese supply is uncertain and much of the Bolivian antimony ore which formerly came to this country is now going to Europe. European consumers are also bidding for Mexican ore and the present large domestic production is therefore of utmost importance.

Scrap Supply

Recovery from scrap, mainly from old storage batteries, has been a large source of supply in recent years. However, during the latter half of 1947, the heavy flow of scrap returned to more normal proportions and the Department of Commerce has estimated the scrap supply in 1948 at 18,000 tons as compared to 20,424 tons in 1947.

New Uses Increase Demand

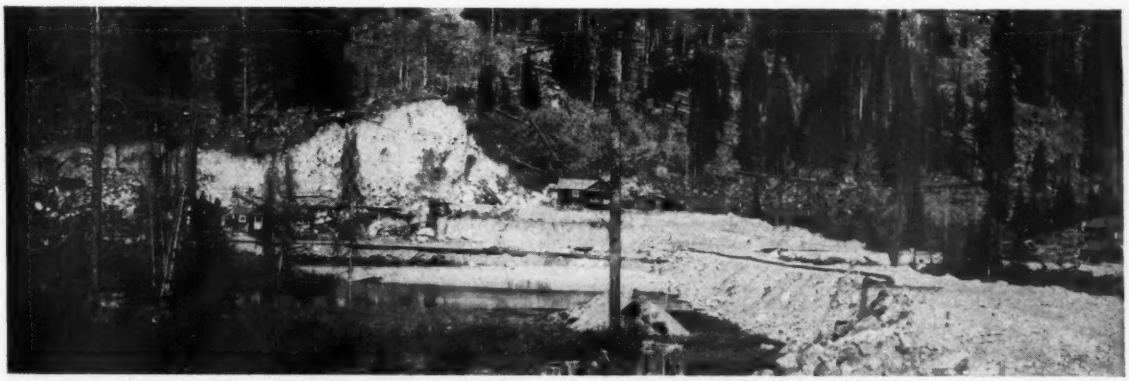
Storage batteries continue to be the largest consumer of antimony for nonmetallic use as well as one of the largest uses of lead. In addition to the use of antimony in bearings, type metal, solder, cable covering, sheet, pipe and collapsible tubes, the nonmetallic uses are becoming more important.

Increasing consumption of antimony in the form of oxide in addition to the older uses in ceramics, enamels, lacquers, etc., has opened up new fields in recent years indicating large potential requirements. These new uses are in fire-retardant paints, flameproof compounds for textiles and in vinyl resins.

The nonmetallic uses are of great importance to the antimony miner, not only because the antimony must come from primary sources, but also because there is little chance of it coming back on the market on secondary material.

Outlook for 1948

In a statement made by the Department of Commerce on Dec. 9, 1947, it was noted that the flow of scrap supply was slowing down and the overall demand for primary antimony showed marked increases in all lines. Further increases can be expected from the European Recovery Program.



From the hills at Yellow Pine, Idaho, comes the bulk of domestic antimony production

Nonmetallic Mineral Industries*

By G. W. JOSEPHSON and B. L. JOHNSON
Respectively
Acting Chief, Nonmetal Economics Branch, and Mineral Economist, Bureau of Mines

ONE of the most prominent features of the domestic scene in 1947 has been the boom in building; consequently, the demand for such nonmetallic mineral products as cement, gypsum, brick and aggregates has exceeded supply. Output of many of the mineral building materials reached record levels. Shortages of food have made the world increasingly conscious of the need for fertilizers. Domestic consumption of fertilizers is rising rapidly, and the output of phosphate rock and potash therefore reached a record shortage.

Similarly, general industrial activity has been so great in the United States during the past year that consumption of chemical raw materials and many of the other nonmetallics has been extremely high. Stockpiling of strategic nonmetallics by the Munitions Board was continued in 1947, but acquisitions were relatively small because most of these commodities were in great demand for current consumption. Noteworthy progress was made in the synthesis of several nonmetallic minerals.

Demand for Aggregates Exceeds Previous Records

Prompted by needs of the construction boom, the total output of concrete aggregates reached a record level in 1947. The bulk of the tonnage was made up of heavy types, but there is growing interest in lightweight aggregates. The output of expanded slag, pumice, and bloated clay has been increasing. During the past few years perlite has been going through the development stage but is now being produced in commercial quantities. Vermiculite is widely used as an aggregate. However, many potential markets are undeveloped because they are too distant from any present source of supply, and none of the raw materials in the area will form satisfactory lightweight aggregates. Usually clays of one type or another are available but not all clays will bloat properly. As it would be advantageous if lightweight aggregates could be produced from virtually any clay, this problem is being studied by the Bureau of Mines. The investigation indicates that sulphur, certain carbonaceous materials, and some fluxes are materials that strongly influence the bloating characteristics of clays.

Cinders have become scarce in recent years owing to the increasing use of powdered coal which burns to fly ash. Recently a method has been devised by which fly ash can be converted to satisfactory cinder. The fly ash contains 6 to 20 per cent combustible material, which is enough to fuse the mass when it is burned in a sintering machine.

The growing use of air entrainment gives some promise that in future aggregate specifications the high content of fines that now appears to be necessary may not be required. However, sand producers are revamping their equipment to meet current specifications. In many instances the sand deposit contains enough fines, but they are lost in washing, classifying, and dewatering operations. Various methods of retaining these fines are being installed. In some cases the fines simply are recovered in a settling basin and blended into the product at a later stage. However, a more satisfactory solution in most plants is to reduce water velocities in the hydraulic equipment by modifying the feed sequence of cone classifiers, by reducing the volume of water, or by lengthening overflow weirs.

High Demand for Asbestos Spurs Work on Synthetics

In 1947, manufacturers of asbestos products have been consuming every pound of asbestos that they have been able to obtain and prices have been rising. In response to this demand, output of asbestos in the United States has increased somewhat; but, as domestic resources of chrysotile are small, most of our requirements came from foreign countries. In the past, Russia has sold substantial quantities of asbestos to other countries, but since the war its exports have been small. Most of the world supply now comes from Canada and Africa. Expansion of output in the established mining areas is in progress, but there is no prospect of early relief of the shortage. In past years the asbestos mills have wasted considerable quantities of extremely short fibers but these are now being used increasingly in asbestos cement products and in asphalt tile. Fundamental research on the constitution and formation of asbestos is also progressing. This work is said to be at an early stage but is of great interest because it offers the possibility of eventual production of synthetic asbestos.

Carbon Dioxide for Artificial Weather

As rain-making with dry ice promises to be extremely important both from the commercial and military standpoints, this recent discovery has been developed actively during the past year. Large-scale experiments were carried out by the military services and other government agencies, but experimentation has become more cautious recently because the question of liability for damage done by the resulting storms is at present an undetermined point of law. However, the Weather Bureau intends to carry out extensive experiments in the Midwest under close observation.

Cement

During the past year the demand for cement for construction has been higher than ever before. Production totaled about 188,000,000 bbl, and as the prospect was that this market would increase still further, the cement industry has been expanding actively.

One rather neglected branch of the cement industry is receiving more respectful attention. It has been found that some cements that have a relatively high free-alkali content will produce inferior concrete when used with aggregates having reactive silica in them. However, this problem can be solved by using portland-puzzolan materials with the reactive aggregates. The blast-furnace cements have been successful in Europe because they can be produced at a cost considerably under that of portland cement, and when properly used, will make concrete of equivalent quality. A blast-furnace cement plant was installed in Monterey, Mexico, during the past year. The cement is made from 40 per cent portland-cement clinker and 60 per cent hydraulic slag.

* Published by permission of the Director, Bureau of Mines, U. S. Department of the Interior.

Clay

Since the war, the outstanding development in the clay industry has been the revival in demand for heavy-clay products. In 1946 production approximately doubled and in 1947 increased about 20 per cent more. This high level of sales is enabling the industry to carry out programs of modernization that are long overdue owing to the depressed condition of the industry during most of the past 20 years.

The refractories industry reached record levels during the war and immediately after the war demand declined somewhat. However, the high-temperature industries have been so active that the demand for refractories is again increasing. One noteworthy new product is a refractory that can be cast which is capable of withstanding temperatures of 3000 F. This product is expected to reduce the construction cost of furnaces that require extensive use of special shapes.

A new colloidal form of the mineral attapulgite, a complex hydrated magnesium-aluminum silicate which is the principal mineral constituent of the Georgia-Florida fullers earth clays, has been placed on the market.

A new plastic made by reacting bentonite with resin-forming organic materials has been developed at the Mellon Institute in Pittsburgh.

Feldspar

The Feldspar Mining Co. of Spruce Pine, N. C., announced that it was preparing to construct a flotation plant.

Production of roofing granules having a syenite rock as a base was begun in Arkansas in 1947 and a byproduct suitable for use in the ceramic industry was also put on the market.

Gem Stones

In studies of radioactivity at the National Bureau of Standards the diamond has been found to be highly sensitive to gamma rays and capable of detecting radiation in the same way as a Geiger-Muller counter. A diamond placed in a strong electric field initiates sharp electrical pulses when gama radiation is absorbed, and a count of the pulses indicates the intensity of the radiation. Advantages of the diamond counter are durability, sensitivity, small size, and comparable cost.

C. F. Chatham has improved the quality of his synthetic emeralds and is now producing about 1000 carats per month. Fair-quality crystals weighing as much as 40 carats have been made and equipment has been installed in which it is expected that stones of 200 carats can be produced.

The production of synthetic star sapphires and rubies was announced by Linde Air Products Co. in 1947.

Synthetic gem rutile has been developed in the laboratories of the National Lead Co., South Amboy, N. J. Boules over 125 carats in weight have been made.

Graphite

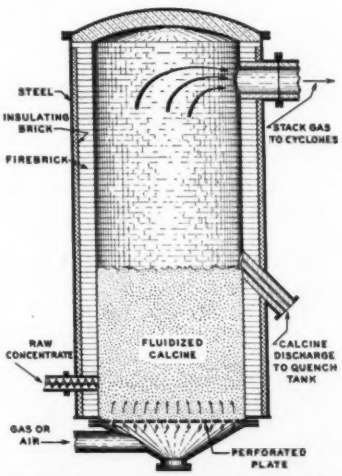
Imports of crucible graphite from Madagascar during the past year have been limited owing to an insurrection. The disturbance was so widespread that production from nearly all of the mines was stopped.

Gypsum

Demands for gypsum products have been so great that the industry has been unable to meet them; hence, extremely large expansion programs are under way. The U. S. Gypsum Co. is investing $42,000,000 and many other companies are expanding proportionately.

Lime

Interest by the lime industry in the development and improvement of methods of burning continues. Two relatively new kilns are the Nelson inclined furnace and the Ellernan Calciner. Ellernan Calciner has a fire box at the side from which hot gases are conducted into the calcining chamber and distributed throughout the stone by two rows of tunnel beams. The kiln is vertical type. After the stone has passed through the calcining zone it is cooled by air which is



Fluosolids process offers advantages in roasting and calcining certain products

admitted through the lime discharge ports and withdrawn by means of another set of tunnel beams below the calcining zone. This kiln uses stone sized from ½ to 1½ in.

During the past year the outstanding development in calcining was the announcement by the Dorr Co. of a "fluosolids" process in which calcination is carried out in a vertical kiln having a number of perforated hearths. The limestone is crushed to minus 6-, plus 65-mesh and fed onto the floor of the top hearth. The hot gases coming from below blow through the bed, keeping the particles of stone in constant agitation. The air is maintained at such a velocity that the mass behaves like a fluid and overflows into a pipe that conducts the material down to the floor of the next hearth below. The material progresses down to the calcining hearth, where fuel is injected directly into the fluid bed. Air to support combustion enters the hearth from the cooling compartment below. Combustion is said to be highly efficient. After calcination, the material passes down into the cooling compartment where air blows through it as on the other hearths, and the finished product leaves the kiln at a temperature of about 500 F. This method has attracted wide interest because it may be applied to the calcination of many other products as well as to lime. A kiln capable of producing 100 tons per day is being designed for the New England Lime Co.

Lithium

During 1946, the lithium industry was still in its postwar doldrums. However, various lithium products are considered to have good prospects of developing substantial markets. Among them is a new compound, lithium-aluminum hydride, which is said to be useful as a reducing agent for organic compounds and to have other promising possibilities. Preparations to mine a large deposit of spodumene in the Cat Lake district about 100 miles northeast of Winnipeg are said to be in progress. A method of producing lithium metal by reaction of spodumene, lime, and ferrosilicon or aluminum in a vacuum furnace has been reported.

Mica

Although the United States is relatively well-supplied with ground mica obtained from domestic mines, output of the higher grades, generally classified as strategic mica, is small. Consequently, invention by the Germans, during the war, of a method of making synthetic mica of high electrical quality was of exceptional interest. A research project to investigate the process was established in this country under the supervision of a private company. A German scientist, who is familiar with the process as practiced in Germany, was assigned to assist in the research. The project has now been transferred to the Bureau of Mines.

A mechanical mica-splitting ma-

chine, devised at the National Bureau of Standards, speeds the splitting process considerably and reduces the period required to train skilled splitters. The rate of splitting obtained with this machine by an untrained operator was 60 films a minute. The average of hand splitting is only 15 to 20 films a minute.

Monazite

As monazite contains thorium, one of the fissionable elements, it has assumed an importance far outweighing its tonnage. Throughout the world its ownership and movement have been brought under strict regulation. Most of the world's monazite comes from the State of Travancore in India, and smaller quantities are produced from the beach sands of Brazil. In Travancore, the Government of India and the State of Travancore jointly supervise the monazite industry. A total embargo had been declared on all movement of the mineral, but this was lifted in 1947 and shipments were resumed but only under close control. India intends to establish a processing industry based on the Travancore beach sands, and it has also established a program of nuclear research. Production of monazite in the United States is negligible but substantial quantities are consumed. Ownership and movement of monazite in the United States were placed under license by the Atomic Energy Commission. These regulations cover all source materials containing as much as 0.05 per cent of uranium plus thorium.

Phosphate Rock

With farm activity at a record, a great demand for fertilizers exists, and this is reflected in exceptionally high shipments of phosphate rock. Sales of phosphate rock in 1947 appear to have reached a new record exceeding 9,000,000 tons.

Exports of western rock were exceptionally large owing to U. S. Army shipments to trans-Pacific occupied territories.

The price trend was upward in 1947, the average value per ton increasing from $4.24 in the first half of 1946 to $5.17 in the similar period of 1947.

In Florida, the Peace Valley mine of the International Minerals & Chemical Corp. is said to have produced more than a million tons of phosphate rock in the 12-month period from July 1, 1946, to June 30, 1947—a record production for an individual mine in the domestic phosphate-rock industry. The Achan mine was brought into operation during this same period.

Construction of additional elemental phosphorus production facilities at Columbia, Tenn., was announced early in 1947 by the Monsanto Chemical Co.

Plans have been announced by the J. R. Simplot Co. for the construction, by the Westvaco Chlorine Products Co., of an electric furnace for producing elemental phosphorus near Pocatello, Idaho.

During 1947, the Permanente Metals Corp. stepped up its electric furnace output of fused serpentine—phosphate rock (a calcium-magnesium phosphate fertilizer) at its Permanente, Calif., plant.

Potash

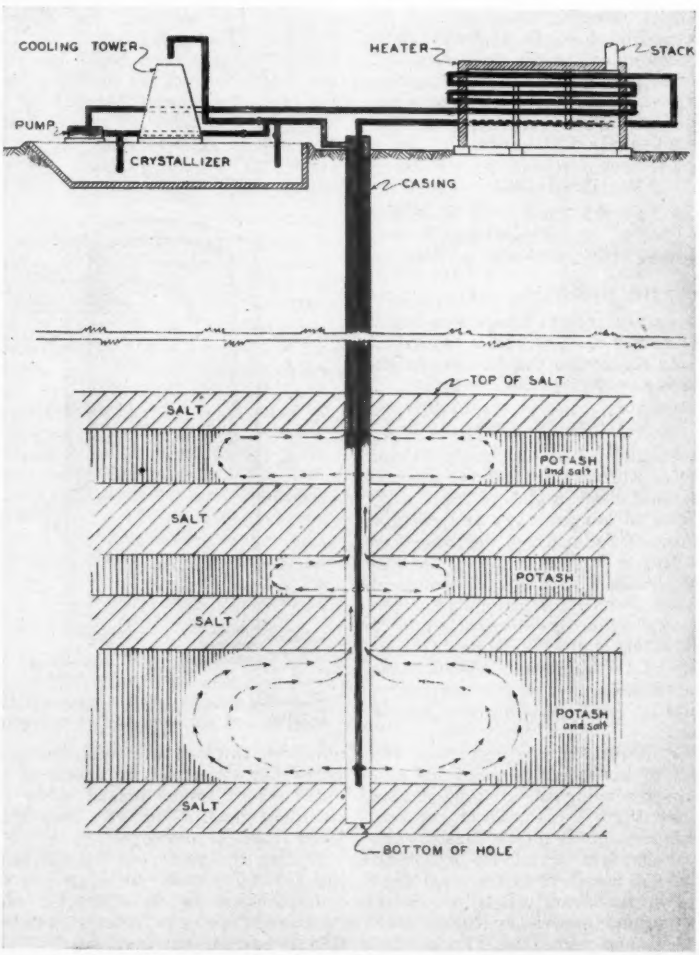
Demand for potash in 1947 continued to exceed the supply available, although domestic production increased. North American deliveries for the first half of 1947 were 12 per cent in K_2O above the similar period in 1946 for agricultural use and 10 per cent for chemical use. The imports of potash received from France in May were the first to enter the United States since before World War II. Allocation of potash in the United States was ended by CPA on Feb. 17, 1947, and according to the International Emergency Food Council, world supplies of potash were expected to equal world demand by 1948.

The Continental Potash Co., Eddy County, N. Mex., has found a section of soluble potash warranting a trial of the Cross solution-mining process. An experimental plant is being installed.

An important discovery of thick beds of potash, averaging 21.5 per cent K_2O, in the southern part of the Province of Saskatchewan, Canada, was announced early in the year.

Quartz Crystals

During the war the Germans attempted to produce piezoelectric crystals that could replace Brazilian quartz crystals. Their success was not outstanding. However, as the United States is equally dependent upon Brazilian crystals, our supply problems would obviously be simplified if domestic sources of piezoelectric crystals could be developed. Consequently,



The cross method of solution mining of potash is in the experimental stage

Raw quartz crystals

there is considerable activity in research laboratories. The Bell Telephone laboratories announced that crystals of ethylene diamine tartrate are satisfactory for use in telephone circuits and a plant has been erected at Allentown, Pa., to manufacture them. Progress is also being made toward the synthesis of quartz crystals. Research men believe that they have discovered the conditions under which quartz crystals can be grown at an accelerated rate, but full success has not yet been achieved.

Salt

Salt output increased rapidly during the war to supply the tremendous quantities of chlorine and soda ash required. Since the war, peacetime demand for these commodities has been great enough to maintain salt production at nearly the wartime level. In 1947, output is estimated to have totaled about 15,000,000 tons.

A bill introduced in Congress making the addition of iodine to table salt mandatory is opposed by the industry because iodine is not needed in some areas and it interferes with the treatment of some diseases.

Stone

Production of crushed stone in 1947 attained a record high, and demand for dimension stone and slate was likewise active. Quarry operators became increasingly interested in delayed-action blasting during the year. Proponents claim that the method both reduces the blast shock and provides more efficient breakage. The blast may be set off either by delayed-action caps or by a special switch that sends the electric charge to successive holes at the proper interval. The switch is said to provide more exact control.

Another trend that drew much attention in the stone industry during the past year has been the increasing use of the drop ball in place of secondary blasting. Some operators have had a considerable amount of trouble in using this method because of the breakage of crane booms, injury to cranemen by flying chips, and general lack of success in breakage. However, this appears to have been due in large part to faulty techniques, as it has been found that a skilled operator using properly designed equipment in a cab protected by a transparent plastic shield can do as good or better a job of secondary breaking than can a crew of jackhammer men. Elimination of secondary blasting is desirable from the standpoint of safety and difficulty of obtaining labor for this type of work.

The slate industry also probably attained a record tonnage in 1947, owing to the large demand for granules and flour. Output of split slate also increased. A bulletin issued by Pennsylvania State College during the past year suggests the following uses for waste slate: Slate lime brick, lightweight aggregate, roofing granules, and raw material for glass and mineral wool.

Vermiculite

Steadily increasing use of vermiculite encouraged production to attain a record in 1947. In addition to its use as loose insulation, it is bonded in a variety of applications—for example, in roof decks and prefabricated house panels—and a refractory bonded with 25 per cent colloidal magnesium silicate is said to withstand a temperature of 2000 F. From Britain comes a report that a new product called Pyrock containing vermiculite bonded with a mixture of cement and lime can be sprayed onto any structural surface to any desired thickness. It is anticipated that this material will reduce construction costs and provide a highly satisfactory insulating wall. South Africa has substantial deposits of vermiculite, and it is reported that an American company has contracted to take the entire output of a raw mine in Northern Transvaal. This material will be imported for use on the east coast of the United States.

Other Minerals

Demand for barite in oil-well drilling, lithopone, chemical and glass industries has been active during the past year and output was near a record.

World-wide demand for boron minerals has been so great that the capacity of American plants has been increased considerably and production was a record rate in 1947.

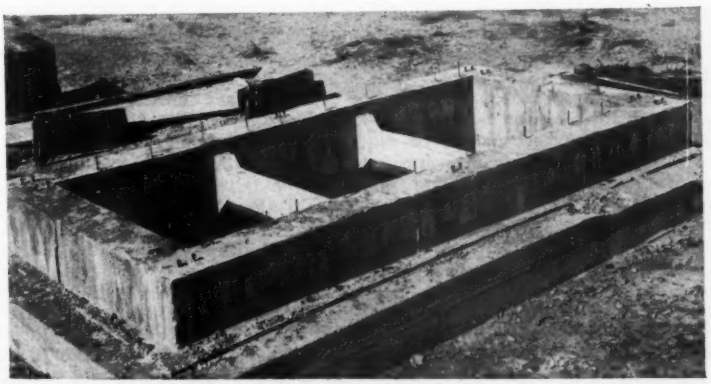
A large deposit of mixed ilmenite and hematite has been discovered in the Romaine River area in northwestern Quebec. It is reported that a process is being developed whereby this material can yield metallic iron and a titaniferous slag that will serve as a raw material for titanium pigments.

Receipts of Indian kyanite have been small owing to disturbances in that country. Substitute products are being marketed with some success, but consumers are still anxious to obtain more Indian kyanite. A new domestic kyanite mine is to be opened by Commercialores, Inc., at Clover, S. C.

There has been a severe shortage of soda ash during the year and expansion is in ammonia-soda plants, which use salt as a raw material. However, there is also considerable increase in capacity at the natural sodium compounds plants. A trona mine is being developed by the Westvaco Chlorine Products Co. near Green River, Wyo., and Permanente Metals Corp. has constructed a plant at Owens Lake, Calif.

It has been reported that a talc mine will be opened by the R. T. Vanderbilt Co. near Balmat, N. Y.

The Harbison-Walker-Pike process has been developed to allow the production of magnesia from dolomite deposits relatively near the consuming areas. The process will produce high-grade magnesia and calcium carbonate is obtained as a byproduct.



Concrete collar at new No. 4 shaft—Potash Co. of America

Aluminum, Bauxite, and Magnesium*

By HERBERT L. CULLEN

Mineral Economist
Bureau of Mines

PRODUCTION of the light metals — aluminum and magnesium — reached their highest peacetime rate during 1947, as application of these metals to a wider variety of uses was continued. With the exception of a short period during the summer, output of aluminum pig was at the highest rate possible under the limitations of available plant capacity and power. Total production of new aluminum, estimated at 570,000 short tons, was approximately 39 per cent greater than the 409,630 tons produced in 1946. Domestic production of bauxite —approximately 1,186,000 tons (dried equivalent)—was slightly larger than the total of the preceding year. Output of primary magnesium ingot—about 12,400 tons—greatly exceeded 1946 production, but apparent consumption was only about half as large as output.

New uses for the light metals continued to occupy the attention of producing companies; and aluminum had amazing success in invading fields formerly given over to other metals, especially in the applications of sheet. Low-cost aluminum sheet, most of which was produced from aircraft scrap, found a ready market as roofing and siding, especially on farm buildings. The inability of steel companies to fill requirements for galvanized-steel sheet contributed to the success of aluminum in this instance. The reaction from the aluminum industry is that aluminum sheet possibly will hold a large part of the market thus gained, even after adequate quantities of galvanized sheet become available. Aluminum sheet gained in use also in home and industrial construction work, especially for ducts for heating and ventilating systems. A principal primary producer has listed more than 5000 uses for aluminum. Expanded application of magnesium, especially in the transportation field where weight-saving is important, seems to depend only on the solution of problems concerning rolling and casting of the various magnesium alloys.

ALUMINUM

During the first five months of 1947, the three producers of primary aluminum were operating virtually at a capacity rate. Demand for product was slower than had been anticipated, however, and stocks built up at the plants at an alarming rate. Production was cut back during June, the Longview plant of the Reynolds Metals Co. suspending operations entirely. Sales picked up in August, and the accumulated inventories at producing plants began slowly to disappear. By early fall it was apparent that consumer demand was strong and that capacity operation of all operable plants would be required. The power available to the industry during the fall months was considerably lower than desired because of low water in certain sections of the country and, in addition, Reynolds had lost the block of power necessary for operation for the Longview plant. Installation of the seventh generator at Grand Coulee permitted the Permanent Metals Corp. to open the Tacoma reduction works (which had not been operated since the war) on Nov. 1, 1947, but it was indicated that reopening of the Longview plant would have to await completion of the eighth generator, presumably about March 1948.

Power Supply Limits Production

With the resumption of operations at Longview, total capacity of the producers will be about 649,000 tons a year. Of this quantity, the Aluminum Co. of America will have 330,000 tons, Reynolds 190,000 tons, and Permanente 129,000 tons. Other plants operated during the war, for which low-cost power is not now available, are located at Torrance and Riverbank, Calif.; Massena, N. Y.; and half of the Jones Mills, Ark., plant. These four facilities represent an additional 234,000 tons annual capacity, but there seems little likelihood that low-cost power for the production of aluminum will be made available within the foreseeable future at the localities cited. In view of the obstacles that would necessarily have to be overcome in order to produce aluminum at these plants, the War Assets Administration was expected to recommend that the plants be sold for other purposes. The Torrance reduction works was particularly vulnerable in the matter of power, since some difficulty had been experienced during the year in providing enough power for operating the huge Basic Magnesium plant at Henderson, Nev. as a chemical plant. The combined power resources of the California Edison Corp. and Los Angeles Power & Light Co. were necessary to provide enough surplus power for the War Assets Administration to offer the plant for sale as a chemical producer. It seemed impossible that power could be supplied for the Torrance plant in any quantity without additional generating facilities. Alcoa has announced its intention of closing the antiquated plant at Niagara Falls whenever conditions permit, and it is to be expected that a replacement presumably would be located in the Pacific

TABLE 1—PRODUCTION OF PRIMARY ALUMINUM IN THE UNITED STATES, 1941–47, BY MONTHS, IN SHORT TONS[1]

	1941	1942	1943	1944	1945	1946	1947
January	21,800	32,250	60,650	84,750	48,650	24,750	50,045
February	19,500	30,100	55,600	74,400	45,650	22,250	47,002
March	22,200	34,400	64,600	80,200	53,100	26,000	53,032
April	22,900	35,000	66,800	77,800	51,600	25,900	51,007
May	25,200	37,200	72,850	76,450	52,000	24,850	51,116
June	25,800	39,500	74,150	66,400	47,500	27,800	46,259
July	27,000	45,000	78,450	67,550	47,900	35,750	47,998
August	27,900	48,950	81,350	61,650	45,800	39,850	47,054
September	27,600	49,550	86,400	47,450	31,600	41,100	43,228
October	29,500	54,150	94,050	48,400	25,000	45,000	43,959
November	29,000	55,000	91,350	44,450	20,800	46,300	43,461
December	30,800	60,000	93,600	46,850	24,000	50,700	.....
Total, preliminary	309,200	521,100	919,850	776,350	493,600	410,250	.....
Final	309,067	521,106	920,179	776,446	495,060	409,630	.....

[1] Based on producers' reports to War Production Board and Bureau of Mines. The monthly figures are preliminary in nature and will not add to the totals derived from the Bureau's annual industry canvass.

* Published by permission of the Director, Bureau of Mines, U. S. Department of the Interior.

Northwest. However, even that eventuality would depend upon completion of further generator facilities there.

Aluminum Sheet Principal Shortage

The greater portion of the apparent shortage of aluminum at the end of 1947 was in aluminum sheet. Ingot capacity seemed to be more nearly adequate than sheet-rolling capacity, and deliveries of extrusions were therefore much easier than those of sheet, the item in demand. Completion of Alcoa's new Davenport plant early in 1948 should overcome the shortage in sheet, when the tremendous rolling facilities of that unit go into operation. Production of finished aluminum products and semifabricated shapes was given a substantial boost in 1947 by the increment of metal becoming available to the primary aluminum companies from operations of certain private contractors in scrapping surplus military planes. These contractors purchased the planes on several Army airfields, set up melting furnaces on the property and proceeded to melt down the bulky aircraft scrap into a form suitable for shipment. By far the greater portion of the remelt ingot produced was absorbed by primary aluminum producers in the production of ingot. Most of it went into low-cost roofing, siding, and utility sheet. The metal recovered in this manner was expected to total approximately 75,000 tons during 1947.

It was indicated, however, that it may be necessary to import some aluminum probably from Canada, to fill the demand until additional low-cost power is available. Primary producers, in addition to the above-mentioned remelt ingot, also absorbed substantial tonnages of select grades of aluminum scrap during the year. These items, combined with the recovery of secondary aluminum in specification ingot by secondary smelters, swelled the total recovery of secondary aluminum to about 330,000 tons for 1947, approximately five per cent more than in the preceding year. Production of ingot by secondary smelters was expected to total 195,000 tons, compared with 207,574 tons in 1946.

Information on imports and exports of aluminum is available only for the first 10 months of 1947. Imports of pig aluminum from Canada were substantial during March, April, May, and June. However, they declined sharply during July and were negligible for the remainder of the year. Just what effect the new tariff reduction, effective Jan. 1, 1948, will have on imports remains to be seen. It is expected that the 1-cent differential will permit Canadian aluminum to compete in United States markets, and if adequate power is available at Arvida, Aluminum Limited could become a formidable competitor of the three domestic producers.

Exports of alloy ingot and slab were almost equal to the imports of aluminum during the 10-month period. One substantial shipment of almost 4400 tons was made by the Reynolds Metal Co. to Argentina. Shipments of ingot were made to Germany, France, and Italy later in the year. These were

TABLE 2—RATED ANNUAL CAPACITY OF ALUMINA AND ALUMINUM PLANTS IN THE UNITED STATES AT END OF 1946[1]

Company and plant	Alumina (from bauxite)			Aluminum ingot		
		Per cent of—			Per cent of—	
	Thousands of short tons	Capacity owned or leased by private companies	Total capacity	Thousands of short tons	Capacity owned or leased by private companies	Total capacity
Aluminum Co. of America:						
Mobile, Ala.	650	27	27	....	....	....
East St. Louis, Ill.	420	17	17	....	....	....
Alcoa, Tenn.	....	....	....	....	....	....
Vancouver, Wash.	....	....	....	....	....	....
Massena, N. Y.	....	....	....	330	51	37
Badin, N. C.	....	....	....	....	....	....
Niagara Falls, N. Y.	....	....	....	....	....	....
Total	1070	44	44	330	51	37
Reynolds Metals Co.:						
Hurricane Creek, Ark.	778	32	32	....	....	....
Listerhill, Ala.	100	4	4	50	7	6
Troutdale, Oreg.	....	....	....	70	11	8
Jones Mills, Ark.[2]	....	....	....	39	6	4
Longview, Wash.	....	....	....	31	5	4
Total	878	36	36	190	29	22
Permanente Metals Corp.:						
Baton Rouge, La.	500	20	20	....	....	....
Spokane (Mead), Wash.	....	....	....	109	17	13
Tacoma, Wash.	....	....	....	20	3	2
Total	500	20	20	129	20	15
Total capacity owned or leased by private companies	2448	100	100	649	100	74
War Assets Administration:						
Los Angeles (Torrance), Calif.[3]	....	....	....	90	....	10
Riverbank, Calif.[4]	....	....	....	54	....	6
Massena (St. Lawrence), N. Y.[5]	....	....	....	54	....	6
Jones Mills, Ark.[3]	....	....	....	36	....	4
Total unleased Government capacity[6]	....	....	....	234	....	26
Total United States	2448	100	100	883	100	100

[1] Data from WAA First Supplementary Report to Congress on Aluminum Plants and Facilities, Feb. 12, 1947, except for aluminum ingot capacity of Aluminum Co. of America and Reynolds Metals Co. furnished by those respective companies.

[2] Entire plant under lease option to Reynolds Metals Co. Option exercised for one-half only because of power shortage. Option on remainder may be taken up in 1947.

[3] Placed in standby condition in Sept. 1944; now used as a warehouse. Some equipment transferred to Troutdale and Spokane. It was announced in Feb. 1947 that Asarco Aluminum Co. had submitted a bid to operate 32,000 short tons (2 pot lines) of the plant's annual capacity.

[4] Placed in standby condition Oct. 1944. Currently used for storage. Lack of cheap power prevents manufacture of aluminum.

[5] Plant closed Oct. 1944. Some electrical equipment removed to Troutdale and Spokane. Aluminum Co. of America has option to lease and in Feb. 1947 was reported to have submitted a bid to purchase.

[6] In addition there were Government-financed, high-cost plants at Queens (Maspeth), N. Y. (144,000 tons), and Burlington, N. J. (54,000 tons), now largely dismantled.

the first shipments of aluminum to those countries since the war. Exports of semifabricated shapes, including sheet, plate, and strip, were considerably higher than during the two preceding years, totaling 39,377 tons for the 10-month period, compared with 3532 tons in 1945, and 15,587 tons in 1946. Asia, South America, and Africa were the destinations for major exports of semifabricated shapes.

Technologic Advances Made

Considerable progress was made during 1947 in all phases of aluminum technology. Work was done on the resistance of various aluminum alloys to marine exposure, on heat treating, and aging of certain types of sheet, and in methods of chemical and metallographic analysis. In addition, problems concerned with rolling, extruding, and welding of aluminum received attention, and advances were made in foundry techniques, especially in fluidity testing of casting alloys and in cleaning and finishing of products. Research in England on the application of aluminum to textile machinery may prove of great importance to that industry in the United States, and expansion of use in the electrical field is inevitable if the present price advantage of aluminum over copper persists.

BAUXITE

Domestic production of bauxite was expected to total 1,190,000 long tons (dried equivalent) in 1947, compared with 1,101,630 tons in 1946. Mine output was thus higher than in any previous peacetime year but was still far lower than the peak of 6,011,177 tons reached in 1943. Arkansas furnished almost 97 per cent of the year's output of bauxite, the remainder coming from Alabama and Georgia. Mine production was at its peak during the first quarter of the year and progressively declined each quarter thereafter.

Imports at High Rate

Although foreign trade statistics are available only for the first three quarters of 1947, it is apparent that imports of bauxite during the year were at the highest rate in history. Imports during the previous record year, 1943, were 1,547,854 long tons (as shipped). The 1947 total, judging from nine months' figures, was more than 1,900,000 long tons. Surinam was the principal source of bauxite imported into the United States during the year, but substantial quantities came from the Netherlands Indies and from British Guiana. In addition, shipments were listed from Brazil, Curaçao (Surinam, probable country of origin), Jamaica, Trinidad, and China. Imports from British Guiana, which had totaled 82,419 tons in the first quarter, dwindled to 2700 tons in the third quarter, and it was evident that increasingly substantial shipments of bauxite were being made from that country to Canada. The Netherlands Indies took the place of British Guiana as the second most important source of United States imported bauxite in the second and third quarters.

Aside from its most important use—in the production of alumina for the aluminum industry—bauxite is employed in chemicals, refractories, abrasives, and various other ways. These applications accounted for almost 20 per cent of the total quantity of bauxite consumed during 1946 and approximately the same percentage in 1947.

As domestic reserves of high-grade metallurgical bauxite were rapidly being exhausted, research work on substitute materials was continued in 1947. The Bureau of Mines issued two publications late in the year concerning work undertaken during the war, and since completed, on Wyoming anorthosite and Pennsylvania nodular diaspor clays. Recovery of alumina from both materials by the soda-lime-sinter process was found to be technically feasible, though commercial application is as yet untested. In addition, use is expected to be made of large deposits of laterite in Oregon, which may yield both aluminum and iron when treated by the Pedersen process. Most of the drilling and exploration in this area have been done by the Alcoa Mining Co., with a view to developing a source of alumina in the Northwest where none has ever been produced.

TABLE 3—PRODUCTION AND IMPORTS OF BAUXITE IN THE UNITED STATES, BY QUARTERS, IN LONG TONS

Quarter [1]	Mine production (dried equivalent)			Imports (as shipped)	Total new supply
	Arkansas	Alabama, Georgia, and Virginia	Total United States		
1945—January–March	228,580	16,226	244,806	156,545	401,351
April–June	253,123	20,566	273,689	222,639	496,328
July–September	229,631	17,065	246,696	226,270	472,966
October–December	193,522	15,793	209,315	134,127	343,442
1946—January–March	193,809	8,123	201,932	157,445	359,377
April–June	259,858	14,501	274,359	196,798	471,157
July–September	309,865	13,446	323,311	260,754	584,065
October–December	299,831	17,794	317,625	237,008	554,633
1947—January–March	312,577	13,917	326,494	432,848	759,342
April–June	298,458	6,416	304,874	493,354	798,228
July–September	269,853	16,125	285,978	509,577	795,555

[1] Quarterly figures are preliminary; their sums may differ slightly from final annual totals.

MAGNESIUM

As a result of the lowered demand for magnesium since the war and the activities of the War Assets Administration in magnesium-plant disposal, the Dow Chemical Co. again found itself in 1946 the sole domestic producer of magnesium. Production of that important light metal in 1947 was confined to the lowest practicable output from about half of the Freeport, Tex., plant of the Dow Co. This production is estimated to have been approximately 12,400 tons during the year, of which almost half accumulated as inventory at the plant. Apparently consumption was therefore only a little more than 6000 tons, or almost 40 per cent less than during 1946.

Supply of Scrap Cuts Use of Primary Metal

This astonishing drop in the use of primary magnesium was undoubtedly due to the enormous volume of magnesium scrap and secondary ingot available for purchase from secondary sources. In addition to the 25,000 tons of magnesium ingot formerly held by the Office of Metals Reserve and presumed to have been transferred to the permanent stock pile, almost 75,000 tons of magnesium scrap in the form of bomb bodies and aircraft scrap were available to industry. This tonnage of secondary magnesium constituted a serious threat to continued operation of the Freeport plant, considering the peacetime rate of consumption of magnesium.

Paradoxically, the principal hope for absorption of the large tonnage of secondary magnesium available lies in the continued high rate of activity in the aluminum industry, which may be expected to use magnesium scrap instead of primary ingot for alloying purposes. Such use increased considerably in 1946 over the preceding year, and it may be presumed to have increased further in 1947 if the advanced rate of primary aluminum production is considered.

Public Slow to Adopt Magnesium

Statistics compiled by the Bureau of the Census reveal steadily decreasing trends in the production of both magnesium wrought products and magnesium castings through the first three quarters of 1947, with slight up-

turns noted in October. It is evident that use of magnesium in the more common applications has not gained acceptance to the extent that was expected and that considerable work remains to be done toward educating the consuming public, foundry operators, and manufacturers in uses of the metal.

Although it is obvious that the use of magnesium for manufacturing articles which demand any measure of portability would be desirable, its acceptance for most of these products depends upon solution or simplification of problems peculiar to magnesium and incident to the rolling or casting of magnesium alloys. Office and household furniture, wheel toys, household appliances, and the like can be made profitably from magnesium, but full utilization of such outlets for the metal depends upon the ability of industry to proceed from research and experiment to commercial production. In addition, magnesium holds such promise in the field of transportation, on account of its extremely light weight, that it is difficult to deny it an ever-expanding use in trains, trucks, passenger cars, and aircraft. Earnings effected by increased payloads through magnesium construction promise an early acceptance in the field.

In endeavoring to further the use of magnesium, a great deal of progress was made during the year toward solving the technical problems associated with the working of the metal. Most of the technological articles published dealt with foundry operations—work was completed on control of grain size in castings, the affect of mold materials, of new gating methods, and of additions of such elements as calcium and zirconium to the melt. In addition, problems incident to hot and cold working, welding, heat treating, and machining of magnesium received attention, and work was also done on corrosion resistance of the metal.

Industrial Diamonds

By SYDNEY H. BALL

Supply Is Tight as Use Increases

SOME 600 years after man saw the first diamond, Pliny, the great Roman encyclopedist, about 79 A.D., describes its first industrial use, splinters to engrave signets. The gem stone for almost 1900 years has had its hordes of enthusiastic boosters, but it has been only in the past dozen years that the use of the diamond in overalls has expanded greatly. In World War II no important munition was made without using the diamond to grind it, to cut it, or shape it. The diamond is, by all odds, the superabrasive, no alloy or natural substance being a feared competitor. Today, some 75 per cent, by weight, of the diamonds sold at wholesale and 15 to 25 per cent, by value, is represented by what twenty years ago was almost an unsalable product—adding stability to the diamond mining industry, once only a luxury trade.

The industrial diamond is normally a byproduct of mining the gem stone; Belgian Congo crushing bort and Bahia carbonado are exceptions, being the chief products of their respective mines. Luckily, when World War II broke, the United Nations had stockpiled many years' industrial diamond production. During the first half of the 1940 decade, we consumed in wartime double current production. And today we are largely dependent on current production plus a small stock on hand produced before the war. The principal users, the United States, Canada, and England—and in pre-war time, Germany—used up just about current production. In America a year ago, most of us underestimated the diamond-set tools consumers had in stock; we also underestimated the stocks of industrial diamond brokers and manufacturers. The supply is adequate, though tight. Diamond-set tools will continue to be turned out, merely because they are the last word in efficiency. To the American manufacturer of such tools who has no Yankee ingenuity, we say simply "vale."

Recently there has been an increase in price. Crushing bort now retails at about $2 a carat; small good quality bort at from $5 to $10 a carat, and carbonado and ballas from $20 to $100 a carat.

Science has always undersold the diamond. Instead of our good old friend Mohs' 9 and 10 for the hardness of corundum and the diamond, the figures are nearer 9 and 40. Although there is no adequate substitute for the diamond as an abrasive, some of the carbides are a partial substitute, at, however, a tremendous slowdown as to time consumed and loss of tolerances attained. Thanks to the diamond in this war, spare parts of all airplane engines were so accurately machined that all of the same engine models were interchangeable.

Stockpile Should Be Increased

The Stockpiling Act No. S. 752 (Public Law No. 520, 79th Congress) lists industrial diamonds among the 17 critical minerals and metals which must be stockpiled. Diamonds have been found in a number of places in the United States, but at no place in commercial quantities. When the war ended, certain government agencies had small surpluses which were transferred to the stockpile, but this supply, presumably meager, should be greatly increased without delay.

When we realize that each year the world produces only a little over one and a half short tons of industrial diamonds, it is extraordinary to realize in how many industries the diamond is a must. (Principal producers, Belgian Congo, Gold Coast, Union of South Africa, Angola, Sierra Leone; "ore" is poor—30,000,000 to 60,000,000 units of rock or gravel handled for one unit of diamonds. In a 2 per cent copper ore, 50 lb of rock is treated to recover 1 lb of copper.)

The industry is wide awake to the fact that new uses can be found for the abrasive and that present methods of use can be improved. There are important research laboratories in South Africa, Belgium, and England, as well as a number in the United States.

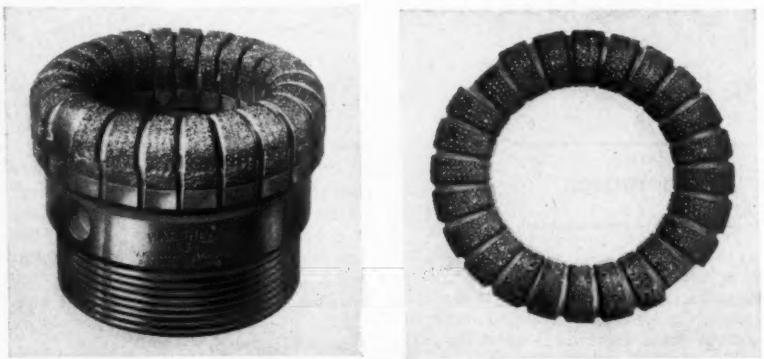
There are three types of industrial diamonds, each with its peculiar place in industry; bort, a trade name for diamond crystals too badly flawed or too off-color to be used in jewelry; carbonado or "black" diamond, a porous but tough aggregate, and ballas, a globular mass of diamond crystals radiating from a common center.

The consumption of industrial dia-

monds dropped sharply after V-J Day. During the war, the United States was using some 12,000,000 carats per annum; in 1946 and 1947, we were using but 4,000,000 to 5,000,000 carats, although the fall in value of imports was much less. The future of the stone is bright, for during the war thousands of plant foremen and tens of thousands of artisans learned of the money and time saved by its use.

Industrial Diamonds Have Diversified Use

Eighty per cent of crushing bort is used in the manufacture of diamond-impregnated wheels used in accurate grinding and precise tooling. They are the most satisfactory tools to shape, sharpen, and hone carbide steels. These wheels were introduced in 1933 and in the seven years between 1936 and 1942, their consumption increased fiftyfold. The wheels



Diamond oil well drilling bit 6⅛-in diam.

are now turned out in shapes suitable for every type of grinding.

In the manufacture of wheels today, the diamond dust is carefully sized for the special use required. It is then evenly mixed with the bonding material, either a plastic, powdered metal, or a ceramic. The mixture is then subjected to high pressure and sintered, the temperature not being high enough to injure the diamond. The bonded material is then used as a thin facing on a metal preform wheel of the required size and shape. Wheels range in diameter from ⅛ in. to 20 in. Diamond dust, as such, is used wherever a powerful abrasive is required, in cutting diamonds and other of the harder precious stones and also in cutting quartz plates for radio and radar. It is also used in shaping diamond dies and watch and instrument jewels, and in piercing them.

You are all so familiar with the diamond drill—the rifle with which we hunt and get orebodies—that little will be said of them. Small borts, as you know, have replaced the carbonado, halving costs and doubling speed. Certain special bits may contain as many as 2000 diamonds, a useful, if not particularly beautiful crown. In instances, crowns are now made with a bonded diamond dust or with fragments of crushing bort or carbonado, instead of bort crystals.

Blasthole drilling, as far as modern mining practice is concerned, dates from the Noranda mine and the year 1935. Today, some 45 of the larger underground mines on the North American Continent are using this cheap and safe method of ore breaking. We are experimenting, as to drifting, with bort-set bits or bits impregnated with diamond dust. Provided the method can be commercialized, the dangers of silicosis will be lessened.

The civil engineer uses the drill in studying dam sites, locating tunnels, and testing building sites. A generation ago, some Mexican oil wells were brought in with diamond drills, and within the past three or four years, a number of wells in Colorado and Texas, where the rock is hard, have been brought in with diamond drills, the bits being over eight in. in diameter.

Diamond tools, first used in 1779, consist of a steel arm which is set with either a rough diamond or one especially shaped for the purpose in view. Sometimes two or more stones are set in a single tool. They shape steel, sharpen hard alloy-steel tools, true abrasive wheels, and give a high finish to crankshafts and other aircraft parts. The fine tolerances permit interchangeability of thousands of engine parts and without its grinding, engines could not be driven at their present speed. Billiard balls, ceramics, plastics, felt rolls, and vulcanite pipe mouthpieces are all shaped with diamond-set tools.

Although crude metal dies for wire-drawing date from at least the third century of our era, it was not until 1869 that the more progressive of the Italian and French drawers of gold wire, to be woven into fine textiles, were using diamond dies. The extraordinary growth of the electric lamp industry put diamond dies on the map, and today they are used to draw most wire less than 0.08 in. in diameter. Before World War II, diamond die making was a cottage industry, centering at Trevaux near Lyon, France. During the war, both America and Great Britain became self-sufficient through mechanizing the industry. Each artisan attempts to make a die with the smallest possible aperture (0.0003 in. or less in diameter), the kind my friend, Dr. Edward H. Kraus, so aptly describes as "putting a wire you cannot see through a hole that is not there." When, as is usual, the holes from the two sides do not exactly meet, the die is reemed out to the smallest size conditions permit. Wire, as it is drawn, passes through a series of dies. The resultant wire, in many instances, is but a small fraction of the diameter of a human hair. Attention, disciples of Isaak Walton: The gut leader of a fine fishing outfit is drawn through a diamond die.

Glaziers' diamonds—small octahedral crystals ⅛ to 1/12 of a carat—were used as early as the 14th century. Due to war's destruction, the supply in Europe today is wholly inadequate and cutting edges are being repolished.

Splinters of diamonds were used by Greek gem engravers as early as 300 B.C. Diamond points are also used to engrave lithographers' stones, metal plates, glass, etc. Splinters are also used to repair fine porcelain.

Some gramophone needles are tipped with diamonds and bearings of large-electric meters are made of diamonds.

Huge circular saws set with diamonds or diamond-set bandsaws are used in cutting and shaping building stone. The earliest American use of the industrial diamond, however, well over 100 yr ago, was to furrow grist-mill stones which had worn smooth.

Many new hardness testers with diamonds as the cutting agent are appearing on the market. A micro-tester designed by the United States Steel Corp. of Delaware, can actually measure the hardness of a single steel grain. Another tester measures hardness of metals up to 925C, the diamond indenter being protected against oxidation.

In September the National Bureau of Standards announced that diamond, being sensitive to radioactivity, colorless crystals could be used as counters for alpha, beta, and gamma rays, replacing the Geiger-Muller counter. Further, the diamond instrument is much more sensitive and lasting than any man-made counter. Owing to its small size, it can be used inside the human body or in small openings in machines. Only the finest colorless, unflawed diamonds are suitable for this purpose. It is a new alarm, to protect the lives of atomic workers.

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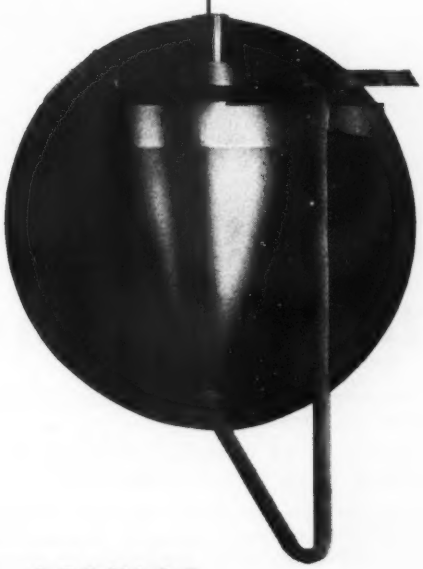

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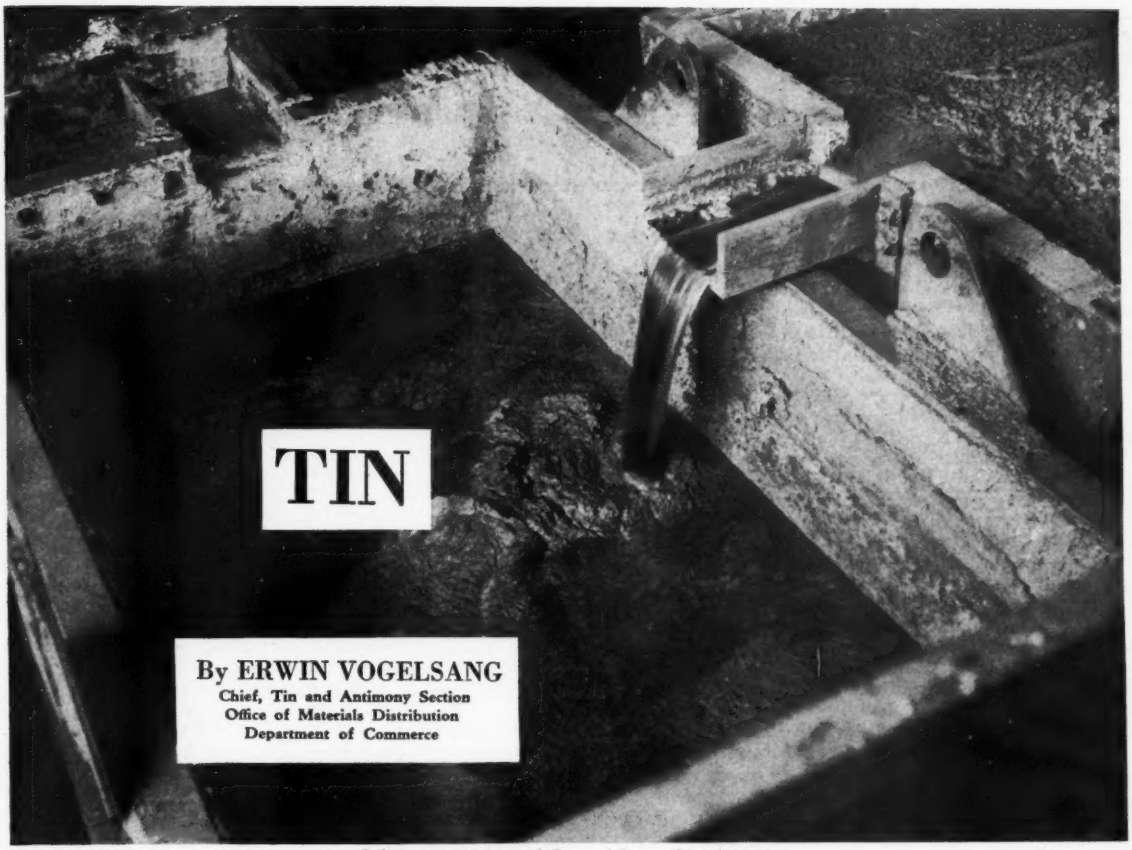


TIN

By ERWIN VOGELSANG
Chief, Tin and Antimony Section
Office of Materials Distribution
Department of Commerce

Bolivian tin is tapped from a Texas City furnace

Conservation Continues as Supply Is Short—Future Outlook is Brighter

THE present shortage of tin is the direct outgrowth of the wartime devastation of Far Eastern producing areas. The United States which normally consumes almost one-half of the world's output is entirely dependent for new supplies on other parts of the world. During the war, the United States, like most of the other tin-consuming countries, was completely cut off from the major sources of supply. Although increasing quantities of tin are now becoming available from Far Eastern sources, this encouraging development is partially offset by lower production in other areas such as Bolivia.

At the April 1947 meeting of the Tin Study Group in Brussels, Belgium, world production during 1947 was estimated at 117,000 tons. Final returns are not yet available for the year but it now appears that production did not exceed 108,000 tons. This compares with production of 87,000 tons in 1946. In general, the Far Eastern areas showed the greatest improvement while those areas upon which the United States was dependent during the war did not fare so well. Production in Malaya rose from about 8500 tons in 1946 to probably at least 26,000 tons in 1947 and production in the Netherlands East Indies increased from approximately 6500 tons in 1946 to over 16,000 tons in 1947. On the other hand, Bolivian output probably declined at least 3000 tons from the 37,500 tons produced in 1946. Production in Nigeria and the Belgian Congo was slightly higher.

Good progress is now being made in Malaya although much rehabilitation remains to be done. The number of dredges operating had risen from 17 in Jan. 1947 to 49 in Sept. 1947. This compares with 104 in prewar use. Even better progress is being made in the Netherlands East Indies. After the war, eight new dredges were ordered. Six were built in the Netherlands and two in the United States; all have arrived at their destination and four are already in operation. The other four were expected to start production at the beginning of the year. As a result, a substantial increase in production can be expected from the Netherlands East Indies during 1948.

Available supplies of tin to the United States during 1947 now appear to have been approximately 85,000 tons consisting of 29,000 tons of tin in concentrates, 30,000 tons of pig tin, and 26,000 tons reclaimed from secondary sources. Consumption, restricted by Government control, appears to have been about 87,000 tons, indicating a net deficit for the year of 2000 tons. This amount was easily absorbed by existing stocks. As a matter of fact Government stocks of pig tin rose 7000 tons, but this gain was counterbalanced by a sharp decline in stocks of concentrates. Stocks of concentrates at the Government smelter are at a minimum working level and production during 1948 will undoubtedly be limited to new receipts.

In 1947 there was a sharp rise in the price of tin. With the ending of price control in Nov. 1946, the Reconstruction Finance Corporation, the distributor for almost all the tin in the United States, set the price at 70¢, thereby stabilizing the market at this level. This action was based upon

the price of £372 per ton ex Singapore or Penang established by the British Ministry of Supply. The price of 70¢ for Grade A tin in New York held until April 2, when the RFC was forced to raise the price to 80¢ in order to conform with the higher price paid for Bolivian concentrates under an agreement reached in the latter part of March. Later in the year the RFC again began negotiations with the Bolivian producers for delivery of concentrates during 1948 and again a higher price was expected. However, before the agreement was concluded the British Ministry of Supply took the initiative in setting tin prices by raising its selling price for pig tin from £437 to £510 per ton. This action occurred on Dec. 16. In conformity with this price the RFC announced a selling price of 94¢ on Dec. 18. On Dec. 31 the RFC announced a new agreement with the Bolivian producers calling for a base price of 90¢ fob South American ports. Since this was in line with the domestic price of 94¢ announced earlier no change in selling prices was necessary.

The continuing inadequacy of supplies has made it necessary to continue conservation and allocation controls over tin. The authority for these controls was extended by the Congress until Feb. 29, 1948, by Public Law No. 188 known as the Second Decontrol Act. Legislation has now been introduced to extend the period of control for at least a year beyond this date.

The controls on tin are contained in Order M-43 administered by the Office of Materials Distribution, Department of Commerce. This order controls the distribution of pig tin and the end-uses of both pig tin and secondary tin. Both imported metal and metal smelted in the Texas smelter are assigned to the Office of Metals Reserve, and are distributed in accordance with authorizations issued by the Office of Materials Distribution. The pig tin produced by private companies from secondary material is also sold by special authorization. The permitted uses of tin are listed in five schedules of Order M-43. These schedules specify the uses and the tin content of the various permitted alloys and coatings. Order M-81, which supplements Order M-43, specifies the type of tin plate which may be used for cans and is one of the principal means of conservation. By means of the above controls it has been possible to bring the limited supply of tin into line with the basic needs of industry. The permitted uses, alloys and coatings, have been determined by years of experience and constant contact with tin-consuming industries.

Since the war, the policy with regard to conservation has been one of gradual relaxation as more tin supplies became available. However, under this policy no provision can be made for additions to the strategic stockpile under Public Law No. 520. Furthermore, the supply and demand outlook is such that little or no tin will be available for stockpile accumulation for at least 18 to 24 months. Therefore, in Nov. 1947, the Secretary of Commerce announced that the use of tin plate for certain non-food items would be restricted and that the savings of tin so effected would be made available for the strategic stockpile. Conferences with the industries concerned are now taking place in order to work out the most effective and least disruptive means of accomplishing this purpose.

TIN—U. S. SUPPLIES, CONSUMPTION AND STOCKS

SUPPLIES

	1946 (Actual)	1947 (Preliminary)
Imports of concentrates	38,116	29,000
Imports of pig tin	6,716	30,000
Domestic secondary pig tin	2,512	3,000
Domestic secondary alloys	22,025	23,000
	69,369	85,000
Consumption and exports	80,386	87,000

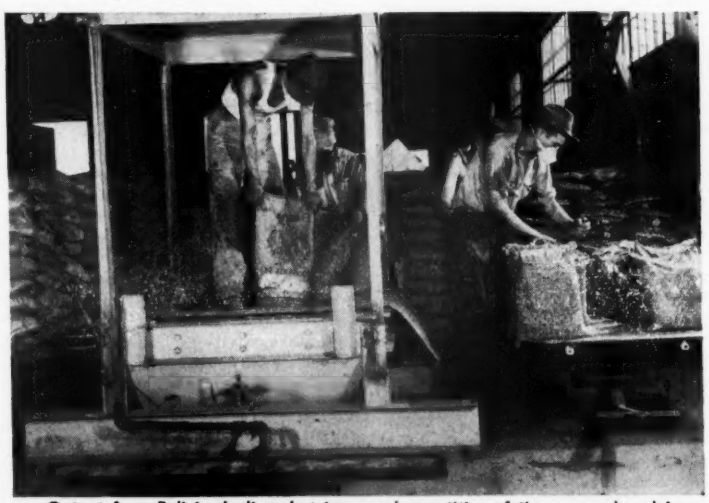
STOCKS

	Jan. 1, 1946	Jan. 1, 1947	Jan. 1, 1948 (Preliminary)
Government:			
Concentrate	32,536	24,642	17,000
Pig[1]	23,350	17,197	24,000
Industrial:			
Pig	14,951	14,837	14,000
Other	8,646	9,109	9,000
Total[2]	79,483	65,785	64,000

[1] Does not include Munitions Board stocks.
[2] The difference between supplies and consumption does not necessarily equal the change in stocks because smelting losses are not taken into consideration as consumption.
Source: Office of Materials Distribution, U. S. Dept. of Commerce.

During the war, supplies of both tin metal and ore available to the United Nations were allocated by the Combined Raw Materials Board. When that Board was discontinued at the end of 1945, in accordance with a joint declaration of the President of the United States and the Prime Minister of England, there was established the Combined Tin Committee which now allocates the pig tin exportable surpluses of the world's major producers among consuming countries. The original members of this committee were the United States, United Kingdom, France, Belgium, and Holland. Canada, China, and India later joined the work of this committee. The United States receives allocations from the committee in addition to the production of the Texas Smelter, the output of which is not involved in the allocation. The allocation system established an orderly distribution of a scarce commodity of which the United States has no supplies. In 1946 the United States received allocations of over 16,000 tons of tin metal from the committee, and in 1947 received allocations of over 31,000 tons. Part of the latter amount was from stocks found in the Far East after the Japanese occupation and is therefore a non-recurring supply. The committee expects to continue operations during 1948.

During 1948, world production should rise to at least 150,000 tons and may achieve 160,000 tons. This would assume political stability in Bolivia and the Far Eastern producing countries. Out of this production the United States should receive at least 32,000 tons of concentrates and 35,000 tons of tin metal. These amounts, together with 24,000 tons from secondary sources, would provide supplies of 91,000 tons and without any transfer to strategic stockpile, would allow a consumption of 4000 tons more than in 1947. A decision to transfer tin to such a stockpile would mean correspondingly less tin available and consumption would have to be held to 1947 levels or less, dependent on the amounts involved.



Output from Bolivia declines but increased quantities of tin are produced in the Far East

Ferroalloys in 1947*

By EDWIN K. JENCKES
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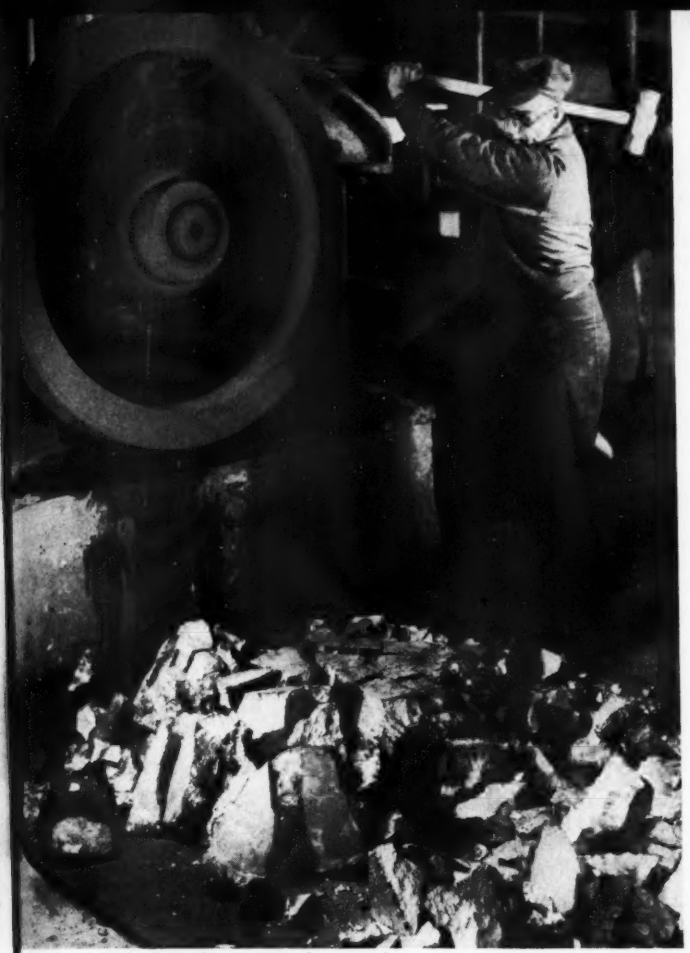


Many ferroalloys are in short supply

OF ALL industries, the steel industry is the largest single consumer of the ferroalloying elements, either for direct additions to the steel bath, or for cutting and forming tools such as the sintered carbide or the complex, cast, nonferrous, alloy tools. The size and prosperity of the steel industry is, therefore, of vital interest to both miners and refiners of this interesting group of metals.

In 1947, the output of steel ingots and castings was substantially 84,000,000 short tons, and of alloy steel more than 7,000,000 tons. These figures establish records for production in peacetime years. It is, however, hazardous to base predictions of ferroalloy requirements on these figures inasmuch as the technical needs of steel users are not yet clearly defined and stabilized. It may be assumed with certainty that, in general, the large steel tonnage has required a large quantity of ferroalloys. Several "best guesses" are given below, but until the final figures for the year are available they can be considered as hardly more than guesses.

In a general discussion which appeared in MINING CONGRESS JOURNAL, February 1946, fundamentals of the steel situation were presented and rereading at this time will be found profitable. However, some of the developments of the last two years are worth noting.

Special high-strength, high-temperature alloys, so necessary to jet propulsion and gas turbine units, are classified as iron-base and nickel-base alloys. According to strict definition the nickel-base alloys are nonferrous, but the additives come from the old familiar group of ferroalloying elements; chromium, molybdenum, cobalt, and smaller quantities of titanium, silicon, manganese, columbium, and others. Conversely nickel itself is an important component of many of the iron-base alloys. During the past year tungsten has made its appearance as an additive in these materials. The field for jet-propulsion units and gas-turbine units is small but it will broaden with improvements in design and metallurgy. As a result, the benefits of increased fuel efficiencies accruing from higher operating temperatures will be obtainable. Stationary gas turbines, believed to be well past the early experimental stage, offer possibilities of development into a position competitive with Diesel engines.

It seems probable that the accumulated demand for stainless steel has not yet been satisfied. The tonnage of stainless produced in 1947 will equal, or even exceed, the record high output in 1946. In this connection it is interesting to note that additions of molybdenum in amounts up to 6 per cent to the stainless steels have been found to enhance their corrosion resisting properties to a marked degree.

The "engineering" steels continue to be large consumers of alloying elements. It is unquestionably true that the National Emergency steels have found wide acceptance, both on account of their low alloy content and consequently low cost, and also because of their excellent properties. Some steel users are returning to the use of SAE steels, and even to some of higher alloy content, either from individual preference or because of desired higher physical properties.

Many minor uses for the ferroalloying elements are to be found in current literature, such as the addition of titanium to enameling steels and the addition of minute quantities of boron to certain steels to enhance harden-ability.

Various writers have designated the twentieth century as the "Age of Alloys" and the validity of this nomination is becoming daily more evident. The number and importance of nonferrous alloys composed of or containing ferroalloying metals is increasing rapidly.

* The statistical data used in the preparation of this paper were furnished by the Metal Economics Branch of the Bureau of Mines. Estimates for the year 1947 were made by the author.

Adequate Known Reserves Lacking

Molybdenum is the only ferroalloying metal of which the United States possesses a large reserve of "commercial" ore. Large deposits containing vanadium are known, but they are not commercial because economic methods of recovery have not been developed. Deposits of manganese and chromite are also available, but they are not, in general, of a sufficiently good grade to be useful for metallurgical purposes. The development of satisfactory and economic beneficiation and utilization processes are essential before these deposits can be useful to industry. For instance, the perfection of electrolytic-deposition methods for the production of metallic manganese and chromium at a cost would encourage the market for the high-purity metals for applications where the iron content of the ferroalloys would be objectionable. Commercial tungsten reserves are at a low point, and the market for domestic tungsten is especially sensitive to the world price of concentrates, particularly when the duty-paid price of imports is at or below the cost of domestic material.

Thus the availability of "ore in the ground" is dependent upon such factors as the cost of mining, refining, the development of new techniques of beneficiation and utilization, and the world price of competitive ores.

European Recovery Plan

At a time when industrial output has not caught up with deferred domestic demand the European Recovery Plan presents the productive factors of the United States with a tremendous problem. Insofar as the ferroalloying metals are concerned, it is safe to say that molybdenum is the only one which will be freely exportable in the form of a raw material. All of the others will find their way into exports as constituent parts of finished or semi-finished materials.

As always, the mining industry will do its utmost to meet the demand; but deficiencies are certain, and must be made up from imports. Care must be taken that the needs of this program, superimposed on already high domestic requirements, does not reduce our reserves of strategic materials to a dangerous point.

Downward Revisions of Tariffs

Representatives of countries attending the 1947 conference on trade and employment at Geneva agreed upon mutual concessions in import duties, such concessions to become effective upon the ratification of the protocol by the several countries concerned. The concessions made by the United States are fully described in Schedule XX, Modified Rates of Duty, Most-Favored-Nation Tariff.

By Nov. 15, 1947, the protocol had been signed by eight (1) of the participating countries, and on Dec. 16, 1947, the President of the United States issued a "Proclamation Putting Into Effect the General Agreement on Tariffs and Trade." As certain countries had not ratified the protocol the proclamation of the President directed that certain of the provisions of Schedule XX should not be applied.

Concerning raw materials of interest to the ferroalloy industry, the following changes in import duties are listed in Schedule XX:

Material	Paragraph, Tariff Act of 1930	Import duty in effect	
		In June, 1946 (1)	On Jan. 1, 1948 (2)
Manganese ore (3).....	302(a)	½c per pound of manganese contained	¼c per pound of manganese contained
Tungsten ore.....	302(c)	50c per pound of tungsten contained (4)	38c per pound of tungsten contained (5)
Nickel and alloys (6)...	389	2½c per pound	1¼c per pound

(1) United States Import Duties, June, 1946, State Department Publication 2540
(2) Bureau of Customs, Treasury Department, Schedule XX, Modified Rates of Duty, Most-Favored-Nation Tariff
(3) Manganese ore, including ferruginous manganese ore, concentrates, and manganiferous iron ore, a of the foregoing containing in excess of 10 per centum of metallic manganese
(4) Equivalent to $7.94 per short ton unit
(5) Equivalent to $6.03 per short ton unit
(6) Nickel and alloys, (except those provided for in paragraphs 302 or 380, Tariff Act of 1930) in which nickel is the component material of chief value. (A higher rate of duty applies to semi-fabricated products)

It is to be noted that the International Nickel Co. has announced a reduction in the price of nickel, duty paid in the United States, of 1¼¢ per lb, corresponding to the reduction in duty.

Schedule XX also contains provisions for the modification of the duties on metal powders, ferro and other alloys, and upon the alloy content of alloy steel.

The Presidential Proclamation of Dec. 16, 1947, specifically excluded the application of the new duty on tungsten ore for the reason that certain countries have not signed the protocol. However, the proclamation does not exclude the application of the new duties on tungsten containing materials covered in paragraphs 301, 302 (g) and (h), and 305 (1) and (2), (alloy steel or iron, ferrotungsten, tungsten metal powder, and other tungsten alloys) of the Tariff Act of 1930. Whether this will have any effect upon the domestic production of these materials remains to be seen.

[1] The United States of America, The Commonwealth of Australia, Canada, and the Grand-Duchy of Luxemburg, and, in respect to their respective metropolitan territories, the Governments of the Kingdom of Belgium, the French Republic, the Kingdom of the Netherlands, and the Kingdom of Great Britain and Northern Ireland.

[2] Data not available prior to 1939.

Manganese Consumption Continues High

Production of domestic manganese ore in 1947 was somewhat less than in 1946. Alloys of manganese utilize substantially 10 per cent of domestic ore and 90 per cent of foreign ore. General imports of manganese ore were substantially equal to those in 1946.

Ferromanganese output totaled over 550,000 short tons in 1947 as compared to 492,000 tons in 1946. This increase is directly attributable to the increase in the output of steel ingots and castings in 1947. As long as the current high rate of steel production continues, a high rate of manganese consumption can be confidently expected.

One encouraging field is the investigation of benefits accruing from the addition of metallic manganese to nonferrous alloys. A sufficiently broad market of this kind, coupled with possible technologic advances in the electrolytic refining of low grade ores could result in placing domestic ores in a position competitive with higher grade imported ores for this use.

Tungsten

Domestic production of tungsten reached a record high of 12,045 short tons of concentrates (60 per cent WO_3 basis) in 1943. A continuous downward trend reached a low point of 593 tons in the first quarter of 1947. In the second and third quarter of 1947 production showed successive increases, and domestic production for the year may reach approximately 2800-3000 tons of concentrates. The increase in domestic output is largely attributable to increased production of the Tungsten Mining Corp. (Vance County, N. C.) and to resumption of mining by the Atolia Mining Co. (Lincoln mine, near Caliente, Nev.) and of the Riley Mine of the United States Vanadium Corp. (near Winnemucca, Nev.). Consumption (2), at its peak

in 1943, declined to a low point in 1946 (6800 short tons, 60 per cent basis (3)), but will undoubtedly be in the neighborhood of 1500 short tons higher in 1947. Unless unexpectedly large imports are recorded for the fourth quarter of 1947, the receipts of foreign ore for the year will be definitely less than in the preceding year.

The United States has always been dependent upon importations for a considerable part of its needs, not necessarily because domestic production could not meet requirements but due rather to the fact that concentrates could be imported and sold at prices with which marginal domestic producers could not compete. If and when the new import duty agreed upon at Geneva (38¢ a pound of tungsten in ores and concentrates, equivalent to $6.03 per short ton unit) is placed in effect, it is entirely probable that any domestic mine now in the marginal or near-marginal class will be unable to meet the price of imported ore. The bulk of importations for consumption in the first nine months of 1947 were from the Belgian Congo, Brazil, Bolivia and the Netherlands Indies, with smaller amounts from China and Canada. It is noteworthy that China has not recovered the position among importing countries that it held before the war and that, since 1944, imports from China have been less than 100 tons of concentrates a year.

Vanadium

The continuous decline in the domestic production of vanadium from the war-time high of 1943 was halted in 1947, when the output for the first nine months exceeded that for the entire year of 1946. Production was largely from the sandstone deposits of Colorado and Utah (carnotite and roscoelite type ores), with some by-product recovery of vanadium from phosphate rock mined in Idaho. Consumption of vanadium in 1947 was virtually 35 per cent greater than in 1946. The 1947 production of vanadium in ore will exceed 2,000,000 lb and consumption of domestic ore will probably equal production.

It is important to note the growing importance which domestically-mined vanadium has assumed in the over-all supply picture. The accompanying table presents domestic production, imports and the new supply of vanadium for the years 1940-1946 and for the first nine months of 1947.

Owing to the "spotty" occurrence of vanadium in the Colorado-Utah-Arizona-New Mexico area the evaluation of reserves is difficult. With notably few exceptions, exploration and development are only a short distance ahead of mining faces, and for this reason mining reserves, as usually understood, are relatively small (4). On this basis Lasky and Pehrson estimate the "commercial reserves" as sufficient for eight years at the average 1935-1944 rate of consumption (5). However, large vanadium containing deposits are known which cannot today be considered as "commercial."

DOMESTIC PRODUCTION, IMPORTS, EXPORTS AND NEW SUPPLY OF VANADIUM IN ORE FOR THE YEARS 1940–1946 AND THE FIRST NINE MONTHS OF 1947, IN POUNDS OF VANADIUM.

	Domestic Production (1)	Imports (2)	Exports (2)	New Supply (3)	Per cent of New Supply from Domestic ore
1940	2,162,916	2,574,951	.....	4,537,867(4)	48
1941	2,513,051	2,138,608	25,402	4,626,197	54
1942	4,439,130	2,422,376	22,140	6,839,366	65
1943	5,586,492	2,052,620	38,180	7,600,932	73
1944	3,527,054	1,284,603	6,254	4,805,403	73
1945	2,963,913	1,552,307	113,927	4,402,293	71
1946	1,277,148	791,057	6,051	2,062,158	62
1947 (5)	1,623,872	630,390	800	2,253,462	72

(1) From records of the Bureau of Mines
(2) From records of the Department of Commerce as compiled by the Bureau of Mines
(3) Production plus imports minus exports
(4) Includes exports—data on exports for 1940 not available
(5) First nine months of year

These include phosphate rock in Idaho, the phosphoria formation in Idaho, Utah and Wyoming, and the titaniferous magnetite deposit at Sanford Lake, N. Y. The utility of these deposits will depend upon future technologic developments to make them available to industry. It is also evident that further exploration of the "Colorado Plateau" may reveal additional resources in the sandstone strata of this region.

Molybdenum

In 1947 the production and consumption of molybdenite showed increases of the order of 50 and 25 per cent respectively over those recorded in 1946.

Domestic output originated in part from molybdenum mines and in part from the byproduct recovery operations incidental to the mining and refining of copper. The three strictly molybdenum mines are those of the Climax Molybdenum Co. at Climax, Colo., the world's largest molybdenum mine, and the Questa, N. Mex., and Empire, Colo., operations of the Molybdenum Corp. of America. By-product recovery of molybdenum was dominated by the outputs of the Utah Copper Co., at Arthur and Magma, Utah, and the Kennecott Copper Corp., at Hurley, N. Mex., and the McGill Concentrator in Nevada.

A considerable excess of production over consumption in 1947 has placed the stocks of concentrates in the hands of producers and consumers at a level comparable to the close of 1941. During the war, year-end reserves of concentrates were much lower than on Dec. 31, 1941, and in 1942 the depletion of inventories amounted to virtually 50 per cent.

Of all the ferroalloying materials, molybdenum is the only one of which a substantial quantity can be exported in the form of a primary raw material (ferromolybdenum, molybdenum oxide or calcium molybdate). It is not probable that domestic consumption plus normal commercial exports plus exports under the European Recovery Plan will exceed the domestic capacity to produce. Known reserves are large enough to satisfy domestic requirements for more than 400 years at the average 1935-1939 rate of consumption (6), or for 157 years at the average 1935-1944 rate (7). As demonstrated by the peak wartime output of 61,700,000 lb of molybdenum in concentrates in 1943, the potential productive capacity of the United States is sufficient to meet any foreseeable demand.

Chromite

In peace time, domestic chromite has not played a large part in the economy of the United States. The production in 1947 was substantially 1200 short tons, and was mined in Oregon and California. Although domestic deposits are known, they are low grade and cannot be expected to be of importance to industry unless and until technologic developments in beneficiation and utilization place them on a basis economically competitive with high grade imported ores. The United States is, therefore, al-

[3] Davis, H. W., Tungsten, preprint of the Tungsten Chapter of the 1947 Minerals Yearbook, p. 2.
[4] Fischer, R. P., Johnson, Albin C. and Nighman, C. E., Section on Vanadium in the Appendix to Investigation of National Resources, Hearings before a Subcommittee on Public Lands of the Senate of the United States, May 14, 15 and 20, 1947, p. 305.
[5] Lasky, S. C., and Pehrson, E. W., Summary, ibid., pp. 176-184. On p. 178 of this document "commercial reserves" are defined as materials available "under the economic and technologic conditions prevailing in 1944."
[6] Burbank, W. S., Johnson, Albin C., and Nighman, C. E., Section on Molybdenum, ibid., p. 269.
[7] Lasky and Pehrson, op. cit., p. 179.

Ferromolybdenum is available in quantity for domestic and export use

most completely dependent on importations of chromite.

Consumption in 1947 was approximately 800,000 short tons, and imports totalled a million tons or slightly more. This comfortable excess of imports above consumption should find its way into inventories. There are, however, complicating factors, of which the most important is the decided deficiency in importation of metallurgical grade ore. This deficiency has been made up by the substitution of good grade chemical ore, particularly ores from the Union of South Africa, for metallurgical uses. The unsatisfactory situation with regard to metallurgical ore is the result of the lack of transportation facilities in Southern Rhodesia and the Union of South Africa, and of disturbed political and economic conditions in some source countries. Considerable tonnages of high-content chromite have been imported from the USSR, but this ore is not highly favored by industry because of its friable character. However, the currently somewhat abnormal condition is far from alarming, and can be expected to improve unless unforeseen conditions arise.

Good grade refractory ores are freely available from Cuba and the Philippine Republic, and the present rate of importation of chemical grade ore is apparently satisfactory.

Nickel

Domestic nickel production is small and comprises primary nickel from ore, byproduct nickel from copper and talc refining, and secondary nickel recovered from scrap nickel and nickel alloys. The domestic output of some 10,000 short tons is unimpressive in view of the large consumption. Importations of oxide from Cuba ceased with the shutting down of the Nicaro plant. Imports of nickel, nickel matte, and oxide in 1947 originated in Canada, Cuba, the United Kingdom, Norway and the USSR. Canadian nickel production in 1947 is expected to approximate that of 1937, the largest peace time year. At the close of 1947, Canada, New Caledonia and the USSR appeared to be the world's largest producing countries, and there are indications that the Norwegian output is resuming at close to the prewar level.

Although the United States is definitely a "have not" in so far as nickel is concerned, the proximity of the Canadian source of supply and the traditional friendly relations between the two countries promise an adequate future supply of nickel for this country.

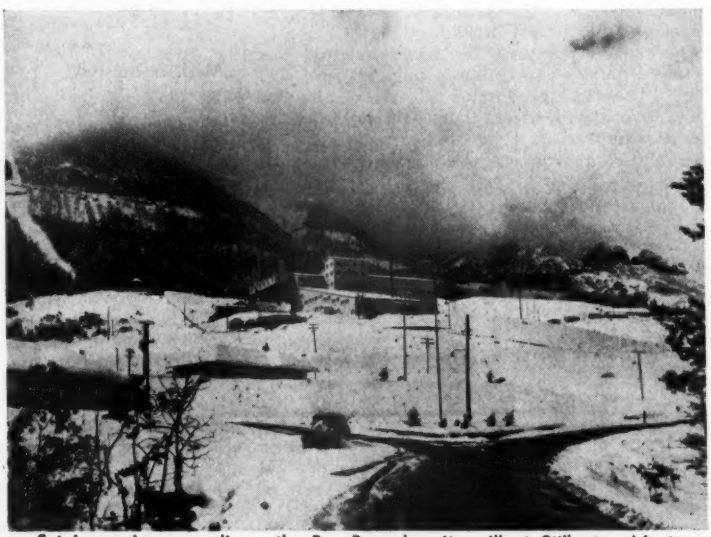
Cobalt

Domestic production of cobalt in 1947 was small and came as a byproduct from the mining operations of the Bethlehem Steel Co., at its Cornwall, Pa., mine. Cobalt ore and "calcines" have been produced by the St. Louis Smelting and Refining Co. at Fredericktown, Mo. but the recovery of cobalt was discontinued in 1946. The development work of the Calera Mining Co. at Salmon, Idaho (Blackbird mine) has yielded promising results. Inasmuch as there are few known cobalt deposits in this country, and none of them of large extent, the United States is definitely in the "have not" category as far as cobalt is concerned.

Imports of "cobalt alloy," cobalt metal, and oxide come from Belgium and the Belgian Congo, and a small quantity of ore is imported from Canada. As long as imports from the Belgian sources are available the supply position of the United States is reasonably comfortable.

Titanium, Zirconium, and Boron

Titanium, zirconium and boron present no supply problem at the moment. Titanium is produced in New York, Virginia, Florida and North Carolina, and is imported from India and Norway. Zirconium is produced in Florida and is imported from Australia, Brazil and India. In view of the easy availability of borax in California at Searles Lake, Boron and Shoshone, the United States is self sufficient and imports are small. Consumption of these elements by the metallurgical industry are important but small and adequate sources of supply are available.



Set in scenic surroundings—the Ben Bow chromite mill at Stillwater, Mont.

Scrap Metals*

By

CHARLES WHITE MERRILL
HERBERT L. CULLEN
and
NORWOOD B. MELCHER

Respectively, Chief and Mineral Economists
Metal Economics Branch, Bureau of Mines

RECORD peacetime industrial activity, with a minimum of interruptions from labor-management disputes, resulted in increased demand for virtually all kinds of scrap metal in 1947 compared with strike-harassed 1946. The tonnage of lead reclaimed, the highest in the nation's history, exceeded recovery from domestic ores by a wide margin. In 1946 the primary and secondary outputs had been about equal.

A feature of the scrap trade was the first full year of a free market since 1940. As the price controls had been removed in 1946, immediate price rises for the various grades of the secondary metals set in, and during 1947 many items reached record highs. Although consumers complained about the high prices, there was the compensating fact that idle sources of supply became profitable and the flow of old scrap was accelerated greatly.

One of the serious after-effects of the war on American industry was the drainage from the vast pool of metals-in-use in the United States. Ordinarily when a metal article is manufactured there begins a long round trip from factory, through use, to junk yard and back to manufacturer as secondary metal. Much of the war goods, however, was unreclaimably lost at the bottom of the ocean or dispersed beyond possibility of collection in some foreign country. The rebuilding of the domestic pool of metal-in-use was proceeding during 1947 and some evidences, like the rising scrap inventories at steel plants, promised that the prewar balance between primary and secondary supplies was being reestablished.

Foreign trade in secondary metals was subject to severe restrictions during 1947, and the movement of these items in and out of the United States was small. Although large accumulations of scrap had developed abroad, mainly as a result of war destruction, difficulties of collection, transportation and export hindered the flow to the United States. Moreover, the foreign demand for reconstruction offered strong competition to those trying to move scrap to the United States.

Domestic Iron and Steel Scrap Condition Improves

Domestic demand and consumption of iron and steel scrap were maintained at record levels throughout 1947. The opening of the year witnessed extremely low stocks of purchased scrap in consumers' yards which by the end of January had dropped to a record low of 1,628,000 gross tons. This condition, however, improved progressively during the balance of the year; and by the end of December stocks in consumers' plants had reached an estimated total of 3,000,000 gross tons, which is virtually equivalent to, although 25 per cent less in terms of weeks' supply than, the prewar figure of 3,012,000 tons on hand Dec. 31, 1939. This was remarkable (and gratifying) in that, even though the consumption of purchased scrap had increased to a level of 2,000,000 gross tons a month, consumers had a six-weeks' supply on hand at the end of the year compared with only a bare three-weeks' supply at the end of Jan. 1947. Consumption of purchased scrap in 1947 totaled 25,400,000 gross tons—an all-time record. However, this record is not expected to stand long. Based on an estimated 1948 steel production of 88,000,000 net tons, a 4 per cent increase over 1947, the requirement for purchased scrap will be 26,400,000 gross tons, or 1,000,000 tons greater than last year's record. The 1948 consumption of pig iron on this basis, which should be made possible by increased blast-furnace capacity, is estimated at 55,700,000 gross tons, and the consumption of home scrap representing 26 per cent of the total melt, will approximate 29,000,000 tons.

Iron and steel scrap prices constituted a major issue in the iron and steel industry throughout 1947, and a considerable effort was made to curtail the spiraling higher prices; early in August the published delivered prices of No. 1 heavy-melting scrap in the Pittsburgh area, exceeded the published base price, fob mills of ingot steel in the same area. When price controls were lifted on ferrous scrap in Nov. 1946, there was an immediate increase in the price of this material. No. 1 heavy-melting steel in Pittsburgh was quoted in Jan. 1947, at $32.25 per gross ton, an increase of $13.25 over Oct. 1946. Prices continued to increase until April, when there was a break in the market for two months —April and May. The next three months witnessed price increases, with August as a high at $40 per ton. In September prices decreased slightly, but in November the cost per ton of scrap reached a high for the year of $41.88 per ton, based on the composite price published by *Iron Age*. No. 1 cast-iron scrap (cupola-cast) was in even greater demand than steel scrap and consequently commanded higher prices than other grades. At the end of the year, the quoted price for this grade was $54.50 at Pittsburgh and $63.50 at Chicago.

Schemes for bringing out additional idle scrap have been largely exhausted. In Oct. 1947, Secretary of the Interior J. A. Krug wrote letters to 40 mining associations urging them to contact their member-companies with an aim toward moving idle scrap from mines and quarries. Secretary Krug, in a subsequent press release, reported that the response from these letters indicated successful cooperation from the associations. Late in the year President Truman requested various Government agencies to market their scrap promptly. The War Assets Administration was moving its iron and steel scrap as rapidly as it was possible to do so. The collection of United States Government scrap in foreign countries continued during 1947.

In its report to the Secretary of State, dated Sept. 21, 1947, the Committee of European Economic Cooperation indicated that the countries participating in the Marshall Plan and Western Germany will experience a shortage of ferrous scrap amounting to 1,500,000 tons in 1948 and increasing to 2,300,000 tons by 1951. However, the Harriman report, "European Recovery and American Aid," has indicated that scrap cannot be exported safely from the United States at this time to supply the European deficiency.

Exports of iron and steel scrap in 1947, which were under a strict licensing system throughout the year, amounted to only about 100,000 tons. At the end of the year exports were under a virtual closed-quota. Czechoslovakia and Poland instigated scrap collections during the summer of 1947 to clean up most of their battlefield

* Published by permission of the Director, Bureau of Mines, United States Department of the Interior.

Reclaimed metal begins a new useful life

scrap. The Russian occupation authorities in Germany started collecting 1,000,000 tons of scrap from their zone, 400,000 tons to be collected in Berlin. The Knutson Bill, including a section to continue the exemption of scrap iron and steel from tariff duties until July 1, 1948, was approved and signed by the President on Aug. 8, 1947. Before suspension of the scrap tariff duties early in 1942, the rate on iron and steel scrap under the Tariff Act was $0.75 per ton, plus additional duties according to alloy content.

Increased Recovery of Nonferrous Metals Scrap

Recovery of the important nonferrous metals from scrap in 1947 was substantially larger than in 1946, as industry marked the first full year of markets free from price controls since 1940. Moderately increased recovery of secondary aluminum, copper and zinc were recorded, but the tonnage of secondary lead reclaimed was the highest in the nation's history.

Demand for nonferrous scrap materials was, in general, steady except for the summer months, but there were variations in demands for individual scrap items as different consumer needs were filled. For example, use of copper-base scrap was sustained during most of the year by the high rate of conversion to refined copper at smelters and refineries, these plants being consumers of pure copper scrap, refinery brass and low-grade scrap and residues. The brass-ingot plants—the principal consumers of alloy scrap items—were irregular purchasers until late in the year and were significant bidders after the greater part of the demand for refined copper had been supplied.

The supply of most items of scrap was more than adequate throughout the year; and, as a result of the slackened demand in early summer, price reductions were general. During the fall months, however, the markets gradually strengthened, especially in aluminum and copper-base scrap, and a period of comparatively high scrap prices developed.

Copper and Brass—Recovery of secondary copper in 1947, although difficult to approximate closely from available data, is estimated to have been about 870,000 short tons, or 8 per cent more than was reclaimed in 1946. This increase was due entirely to the accelerated treatment of scrap by primary smelters and refiners, as the demand for refined copper exceeded supply in the early part of the year. Another factor promoting increased recovery of copper as refined metal, statistically, was the shipment of a large tonnage of brass scrap to this country from the United Kingdom for conversion to refined copper. Recovery of unalloyed copper from scrap in 1947 is estimated at 285,000 tons compared with 136,909 tons in 1946.

Production of commercial brass and bronze ingot was expected to total approximately 304,000 short tons for the year, a decline of 12 per cent from the 346,241 tons produced in 1946. Demand for ingot by brass foundries was exceptionally weak during the summer; and output declined from a peak of 30,836 tons in January to only 16,393 tons in July, then increased again to the end of the year. Because of the dull market, competition for sales was keen, some price quotations being made below the level established by the majority of companies. As a result, the daily trade papers carried dual price quotations for most of the year. Some firms that had purchased scrap at high prices early in the year experienced losses in the lowered market for their product.

Brass-mill production in 1947 was expected to total about the same tonnage as in the preceding year, although the rates of operation in the two years were reversed. Labor difficulties in the first half of 1946 held down production, but activity was high in the second half-year—this rate of operation continued into the first half of 1947, then slackened as demand was abruptly satisfied. Late summer found some mills working three or four days a week, as a result of cancellation of orders. Since total brass-mill production during 1947 approximately equaled that in 1946, it may be assumed that recovery of secondary copper in their products was about the same as in 1946 (266,859 tons). Most of the scrap used by these mills is obtained from their own customers—the fabricators of brass sheet, rod, tubing, etc.—and only a comparatively small portion of their intake comes from dealers or other sources in normal times.

In general, the copper scrap market followed the trend of ingot-maker operations. Lowest prices and a relative oversupply occurred during the summer, after the demands for brass ingot and refined copper had been satisfied and before ingot production improved later in the year. Relative abundance of brass scrap at the close of the third quarter prompted the Office of International Trade to raise the export quota to 10,000 tons for the fourth quarter, but it is doubtful whether this limit was reached, as domestic demand improved substantially during November.

Lead—Recovery of secondary lead from scrap was much higher in 1947 than ever before. Preliminary figures from the monthly survey indicated a total of 500,000 short tons reclaimed, compared with 392,787 tons in 1946 and 397,416 tons in 1941, the previous record year. Thus, secondary recovery exceeded domestic mine production of lead for the second year and smelter production from domestic ores and base bullion for the third year in succession. Since mine production totaled only about 375,000

tons in 1947, it is apparent that the nation is becoming increasingly dependent on secondary lead and imported ores and bullion to satisfy the domestic demand.

The unprecedented rate of conversion of lead-base scrap attained during the year is traceable directly to the price of lead. After the removal of price controls on Nov. 10, 1946, the price of refined lead rose rapidly and the price of lead scrap followed. Increased scrap prices started an immediate flow of all scrap items to consuming plants and as the demand for lead in any form seemed insatiable, a tremendous tonnage of scrap was converted.

Consumption of battery plates, the most important lead-scrap item, totaled approximately 390,000 tons during the year, a gain of more than 20 per cent over the 323,614 tons used in 1946. This increase was registered in spite of the fact that smelting charges on battery plates doubled in the 12-month period following the removal of price controls. Use of soft lead scrap also gained considerably. Consumption of all lead-base scrap items apparently set an all-time record in Oct. 1947, when the use of over 61,000 tons was recorded in the Bureau of Mines' monthly survey. Total consumption of lead scrap was approximately 625,000 tons during the year, compared with 508,833 tons in 1946.

Aluminum—The recovery of secondary aluminum from scrap in 1947 is estimated at 330,000 tons, or 19 per cent greater than the 278,073 tons reclaimed in the preceding year. The increase was due to the enormous volume of aircraft scrap that was converted to ingot. Final figures are expected to show the recovery of about 160,000 tons of aluminum from old scrap compared with 90,535 tons in 1946; the volume of new scrap treated declined about 8 per cent.

Production of aluminum alloy ingot from scrap by secondary smelters was expected to total approximately 195,000 tons in 1947, compared with 207,574 tons in 1946. Aluminum ingot production followed the same trend as that of brass ingot—an uninterrupted decline until July, and an increased rate of activity each month thereafter. Demand for ingot was exceptionally low during the summer and smelters resorted to selective buying in scrap purchasing, with the result that they were competing with primary aluminum producers for the more desirable items, such as alloy sheet and castings. Prices for these items were therefore well-sustained, but grades less in demand, such as mixed turnings and borings, brought prices relatively lower than usual.

Recovery of secondary aluminum at primary plants was approximately the same as in 1946, when 73,388 tons were reclaimed. The primary producers customarily absorb substantial tonnages of scrap, which is mixed with primary pig aluminum and emerges either in the form of wrought products or castings, or as ingot for sale to others. In addition, during 1947 these companies absorbed huge quantities of remelt ingot in the production of low-cost roofing, siding and utility sheet.

The remelt ingot used for this purpose was the product of five private contractors who purchased the planes on certain Army fields for disposal and set up their own melting furnaces to facilitate the handling of aircraft scrap. It is estimated that 75,000 tons of secondary aluminum was recovered during 1947 from this operation. Some choice scrap items, like propeller blades, were sold to custom smelters for conversion, but most of it was melted down on the premises.

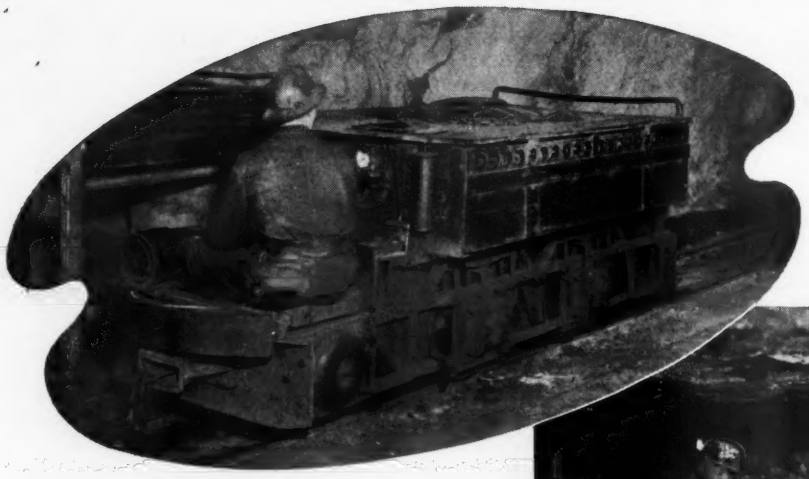
Zinc—Zinc scrap was available in relative plenty throughout 1947 and treatment was greater than in the preceding year. Total recovery of secondary zinc is estimated at approximately 315,000 tons, compared with 300,682 tons in 1946—a modest increase, even though it is expected that final figures will show a slight decline in recovery from copper-base scrap. During the war years, more secondary zinc was recovered from copper-base scrap than from zinc-base; however, it is indicated that recovery from zinc-base predominated in 1947, the first time since 1941.

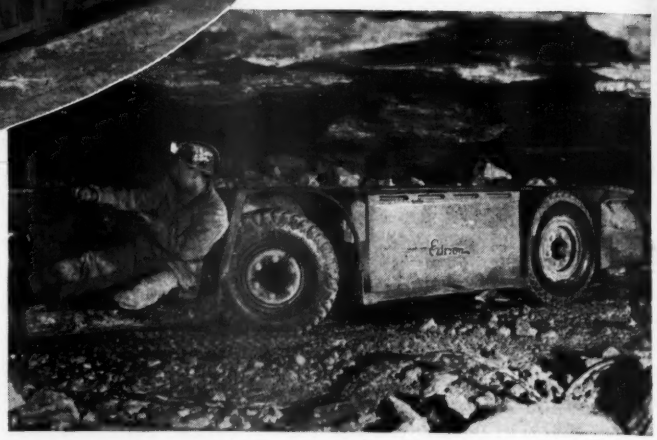
Total consumption of zinc-base scrap is estimated at 230,000 tons for the year, or about 11 per cent more than the 206,876 tons used in 1946. The greater part of this increase was in the use of drosses, skimmings and chemical residues, because of increases registered in the consumption of slab zinc for galvanizing and of zinc dust in chemical products.

Production of most secondary zinc products gained over that in 1946. Output of redistilled slab rose from 44,516 tons in 1946, to about 54,000 tons in 1947, and recovery of secondary zinc in chemicals such as zinc oxide and lithopone also increased.

Scrap moved freely in 1947 under a free market

Zinc scrap differs from most other metals in that about half of it is reused in chemical products with a wide variety of uses and in zinc dust, nearly all of which is used in chemical processes. The other scrap metals are largely consumed in metallic articles. Zinc scrap may therefore be said to have a greater diversity of application than scrap of other metals, and the secondary zinc plants are thus less subject to slack periods than other secondary metal plants. Another peculiarity of zinc scrap is that most of it, being byproduct residue, passes directly from generator to consumer without entering dealer channels.





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WHEELS OF GOVERNMENT

As Viewed by A. W. DICKINSON of the American Mining Congress

THE legislative calendar of the current session of the Congress has now taken definite form with dates fixed for final action on a number of the outstanding issues. April 1 is the date now set for winding up Senate action on the Marshall Plan for a European recovery program. Meanwhile, former President Herbert Hoover has called upon the Senate Committee on Foreign Relations to limit the contemplated foreign aid to a 15 months' period and a total expenditure of approximately $4 billion. Mr. Hoover's recommendation also called for administration of the program under a bi-partisan policy commission.

Budget

The Administration's $39.7 billion budget for the fiscal year 1949, submitted to Congress in the second week of the current session, was termed shocking and a threat to the solvency of the United States by Congressional leaders. The figure is $2 billion higher than the President's budget request for 1948. The White House estimate of income for the 1949 fiscal year was $44.5 billion.

Sitting in judgment on the Administration's request, the Senate-House Joint Budget Committee, created by the Congressional Reorganization Act of 1946, has just recommended a "minimum" cut of $2.5 billion with a minimum payment of $2.6 billion on the national debt. The committee stated that Government spending is the single greatest inflationary force and that expenditures should be curtailed wherever possible. It estimated 1949 Federal income at $47.3 billion, thus leaving a surplus of $10.1 billion above its contemplated $37.2 billion budget. This figure would also allow for substantial tax reduction, and the committee said in its report that the people "should be relieved somewhat of the burden of wartime taxation."

The Senate and House are expected to vote soon on the budget figures recommended by the Joint Committee.

Tax

February 23 has been set by Chairman Millikin of the Senate Committee on Finance as the tentative date to begin hearings on the Knutson individual income tax reduction bill, which passed the House February 2 by a vote of 297 to 120. In the Senate the $6.3 billion tax reduction measure is due for a cut of $2 billion or a little more, with the expectation that at such a figure a White House veto will be overridden.

There is still a possibility that another bill may be put through in the present session, revising certain administrative provisions of the existing revenue laws which have resulted in inequitable treatment of taxpayers and endless difficulties to the Bureau of Internal Revenue in its relations with individuals and business enterprises.

Economic Controls

Administration forces have admitted the probable defeat of their proposals for restoration of price ceilings, allocations and other major controls. In the course of over a month of hearings before the Senate Committee on Banking and Currency, representatives of industrial enterprise and labor followed Administration proponents of such a program, and blasted the proposals with effective testimony.

Vice President Thomas Kennedy of the United Mine Workers told the committee that the mine workers are emphatically opposed to the restoration of wage and price controls because of their wartime experience with such regulation. President L. E. Gaines of The New River Company called attention to the bituminous coal industry production record attained in 1947, even under the handicap of a car shortage. He referred to Secretary Krug's estimate of 625,000,000 tons to be required in 1948 and explained to the committee that such a tonnage offers no problem at all to the coal industry, which could produce much more if necessary. Mr. Gaines stated emphatically his belief that " * * * Government regulations of any description will have a tendency to retard rather than to accelerate the production of coal. Therefore, we most earnestly suggest that this great basic industry be allowed to serve the American people without any interference or restrictions on the part of Government."

President J. A. Shafer of the American Retail Coal Association, in opposing Government rationing, allocation or pricing, said, "Any steps to impose such controls on any branch of this industry can, in my opinion, only succeed in creating shortages and dislocations where none existed before."

Testimony in opposition to controls on copper and brass was given by Simon D. Strauss, American Smelting & Refining Co.; Roger E. Gay, Bristol Brass Corp.; and C. C. Felton, Revere Copper and Brass, Inc.

Secretary Julian D. Conover of the American Mining Congress emphasized to the committee that "The answer to rising prices and inflation is increased production. Government

Washington Highlights

CONGRESS: Marshall Plan holds spotlight.

BUDGET: Joint Committee finds $10.1 billion surplus.

TAX: Moderate reduction seen.

ECONOMIC CONTROLS: Price fixing and allocation remote.

TRADE AGREEMENTS: Act may be amended.

PAYROLL TAX: Regulations affecting "leasers" deferred.

REORGANIZATION: USES and employment security transfer.

STREAM POLLUTION: House drafting bill.

ST. LAWRENCE: Project sponsors face defeat.

SYNTHETIC FUELS: Production speeded.

controls stifle the incentive to produce and prevent industry from operating within the natural laws of supply and demand." He declared that removal of wartime ceilings and steps toward easing of the heavy tax burden upon venture capital have encouraged exploration, development and production. Mr. Conover stressed that, "The present situation calls for further steps to provide incentive for mining development rather than reimposition of hampering controls."

Foreign Trade Agreements

Although the President issued a further proclamation on January 30, placing tariff reductions in effect on commodities imported from 24 countries, no change was made in the status of antimony, tungsten and other minerals on which rate reductions were withheld from becoming effective in the first proclamation, of December 16, 1947, as discussed in the January JOURNAL.

An interesting angle on the tariff situation developed during the Denver hearings on February 3, 4 and 5 of Senator Malone's (Rep., Nev.) Natural Resources Economic Subcommittee of the Interior and Insular Affairs Committee. The chairman inquired of over 30 witnesses concerning Section 336 of the Tariff Act of 1930, which provides for equalization of costs of production. This is the Section which directs the President to approve by proclamation increases (or decreases) up to 50 per cent of the statutory tariff rate, upon a finding by the U. S. Tariff Commission that duties expressly fixed by statute do not equalize differences between domestic and foreign production costs. The opinion of the witnesses was asked concerning an amendment which Senator Malone proposes to offer when the Administration makes its request for a further extension of the Reciprocal Foreign Trade Agreements authority beyond June 12, 1948. The amendment would direct the U. S. Tariff Commission, on its own motion, to institute investigations into the differences between foreign and domestic costs of commodities and to make recommendations to the President. The witnesses were unanimous in their approval of the proposed amendment as a constructive step.

Social Security—Employes

The question of who are employes and therefore subject to Social Security taxes, as posed by the proposed new regulations of the Bureau of Internal Revenue (discussed in last month's JOURNAL), has received prompt attention. The effective date of the new regulations has been indefinitely deferred. In the meantime, a rule has been granted and early House action is anticipated on H. J. Res. 296, introduced by Representative Gearhart (Rep., Calif.), which would "maintain the status quo in respect of certain employment taxes and social-security benefits pending action by Congress on extended social-security coverage." Enactment of this resolution would freeze the existing situation until Congress has had a full opportunity to act on the entire question of Social Security coverage. The resolution further specifies the term "employe" does not include any individual who, under the common-law rule, has the status of an independent contractor—this specifically excluding "leasers" or "tributors" in mining operations.

Reorganization Plan

Early House action is anticipated on a concurrent resolution providing for the rejection of the President's Reorganization Plan, which would transfer the U. S. Employment Service and the Bureau of Employment Security (formerly the Unemployment Compensation Bureau) to the Department of Labor. The USES is now operating in the Labor Department under a wartime executive order, while the Bureau of Employment Security is presently a unit of the Federal Security Agency.

Representative Clare Hoffmann's (Rep., Mich.), Committee on Expenditures in the Executive Departments, which reported the concurrent resolution to the House, expects quick passage, but unless the Senate also approves the rejecting resolution by 60 days from January 19, the proposed transfer will go into effect.

State officials and representatives of industries appeared at the hearings in opposition to the proposed transfer. It is pointed out that impartial administration cannot be expected from the Department of Labor, which after all in a large measure represents organized labor. At stake is the administration of the $8 billion employment reserve, mainly collected from taxes paid by employers.

Since the return of State employment services to the States in 1946, neither the USES or the Bureau of Employment Compensation is an operating agency—they do not operate employment services nor pay employment benefits. Every attempt to federalize the program in peacetime has been rejected by Congress. The question of whether the Federal Government shall exercise complete control over State operations is of real importance, because the Federal Government could thus dictate State unemployment compensation policies and completely regulate the payment of unemployment benefits. Involved in the controversy, also, is the upsetting of the present experience rating features of State laws, for if the Labor Department is placed in control of social security functions the experience rating system would probably be abolished and all employers would be taxed at a flat rate of unemployment compensation.

Stream Pollution

The seven-man Special Subcommittee of the House Committee on Public Works, under Representative James C. Auchincloss (Rep., N. J.), is expected to report a water pollution bill in February. The subcommittee was appointed following an executive session of the full committee January 20, and will have before it the Taft-Hartley water pollution bill which passed the Senate July 16, 1947. Also for consideration are the Spence and Mundt bills which were considered at hearings before the full House Committee early last summer.

It is anticipated that the subcommittee will report a bill drafted around the Senate-passed measure, which provides for Federal enforcement of pollution abatement only after efforts by State authorities have been exhausted, and then only with State consent. This Senate measure provides that the courts, in considering actions for abatement, shall give due consideration to the practicability and to the physical and economic feasibility of securing abatement of any pollution proved. The courts are given jurisdiction to enter such judgments and enforcement orders as the public interest and the equities of the cases may require. Grants-in-aid are replaced by Federal second-lien loans.

St. Lawrence Project

Determined opposition to the bill which would authorize construction of the proposed Great Lakes-St. Lawrence Seaway and Power Project did develop in a spectacular way when debate opened on the Senate floor January 26.

Declaiming against the "St. Lawrence Iceway" Senator Lodge (Rep., Mass.), attacked the argument that the project would be self-liquidating through tolls, denied that it would be an aid to national defense, and stated that its costs cannot be estimated. Senator Butler (Rep., Nebr.) declared that the authorizing bill "proposes that we spend another half billion dollars on a proposal for which no clear case has been made, and which would be of very doubtful value. If we mean what we say about reducing cost of Government, we cannot possibly afford to approve this measure at this time." Senator Ives (Rep., N. Y.), castigated the project as "an inexcusable waste of money" and said that if power is needed the State of New York and the Province of Ontario could work

(*Continued on page* 136)

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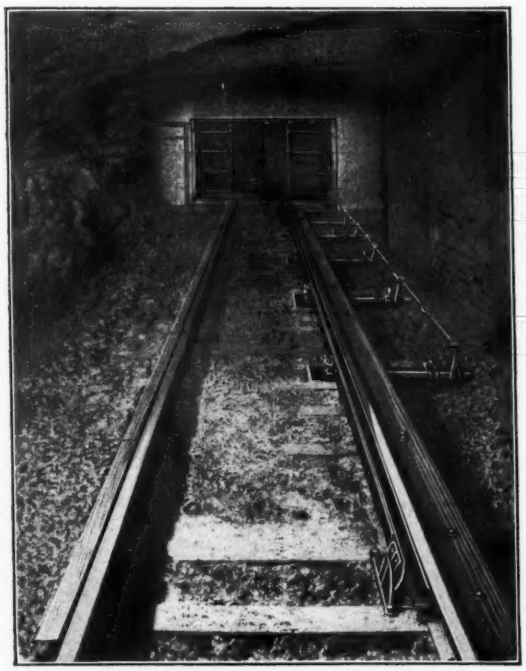

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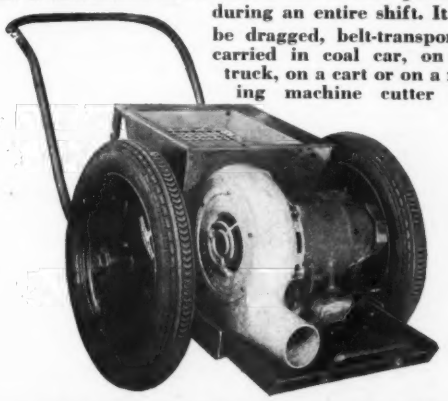

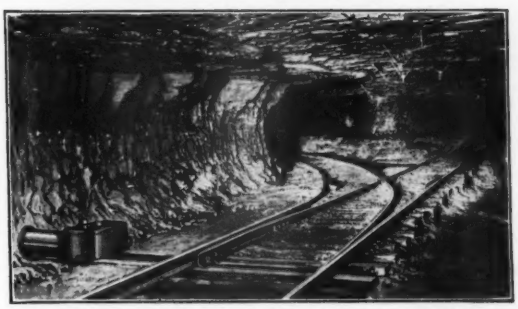

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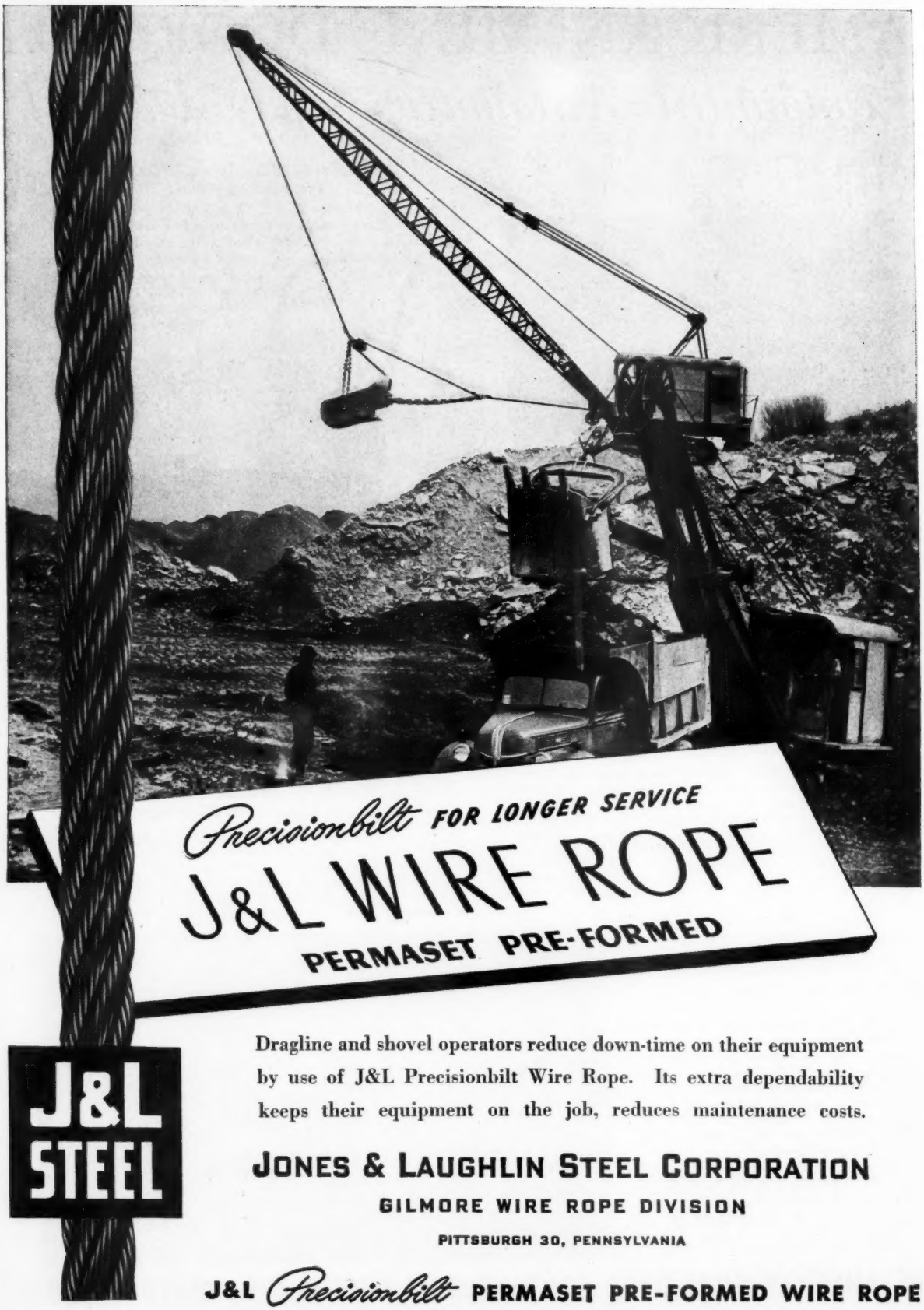

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JONES & LAUGHLIN STEEL CORPORATION

GILMORE WIRE ROPE DIVISION

PITTSBURGH 30, PENNSYLVANIA

J&L *Precisionbilt* PERMASET PRE-FORMED WIRE ROPE

Personals

W. A. Gallagher of Vincennes, Ind., has been appointed assistant to E. P. Humphrey, vice president of the Westmoreland Coal Co. and the Stonega Coke and Coal Co., with offices in Philadelphia. During the past several years Mr. Gallagher has been associated with the United States Bureau of Mines as supervising inspector of coal mines in the States of Illinois, Indiana, Missouri, Iowa, Eastern Nebraska and West Kentucky.

Herbert Starchman has been promoted from manager of the San Juan Mine of Operations, Inc., to mines supervisor of the newly-acquired properties of his company. Mr. Starchman was formerly associated with the Hecla Mining Co. and with the Copper Queen Branch of Phelps Dodge at Bisbee.

Walter Hornsby, formerly assistant chief, Kentucky Department of Mines and Minerals, resigned recently to become superintendent of the Blue Pennant mine, of the Glogora Coal Co. at Blue Pennant, W. Va. The position was held by his brother for the past 20 years prior to his death.

The Texas Gulf Sulphur Co. has announced the resignation, because of ill health, of **Henry F. J. Knobloch**, secretary and treasurer of the company.

The company also announced the election of **Richard T. Fleming** as secretary and general counsel; **Edward C. Meagher** as treasurer; and **William Attwood** as controller and assistant treasurer.

E. W. Whitman of Ishpeming, Mich., has been promoted to the post of superintendent of the Morris iron mine of the Inland Steel Co. For the past two years he has been assistant superintendent. **John H. Strome** has been appointed to the position of safety director for the iron ore and limestone operations of the Inland Steel Co., succeeding **W. T. McCormick** who will now give full attention to his work as supervisor of occupational hygiene at Inland's steel works at Indiana Harbor, Ind.

Edward Griffith was elected president of the Lackawanna & Western Coal Co. at a meeting of the board of directors held on Dec. 20, 1947. He succeeds Gordon C. Cooke, who recently tendered his resignation. At the same meeting **R. F. Duemler** was elected vice president and general sales agent.

E. E. Littler, purchasing agent for the Anaconda Copper Mining Co. since 1925, has retired after more than 48 years with the company. **A. Baird Harris, Jr.**, who has been assistant purchasing agent for the past two and one-half years, has been appointed as purchasing agent.

George W. McCaa was recently appointed general superintendent of the Fairmont Division mines of the Consolidation Coal Co. (W. Va.), according to an announcement made by George R. Higinbotham, vice president operations. Mr. McCaa was previous mine superintendent of Mine 25 near Clarksburg until Jan. 1, 1947, when he was transferred to Mine No. 63. Mr. McCaa is a 1935 graduate of Lafayette University and has been continually associated with coal mine engineering and production since receiving his degree.

Kenneth K. Kincell has been appointed to the position of superintendent at Mine No. 63 at Monongah, where he succeeds Mr. McCaa. Mr. Kincell has been associated with the company since 1933 in various capacities including that of section foreman, assistant mine foreman and assistant superintendent.

Heath Steele, vice president of the American Metal Co., sailed on the **Queen Mary** on Jan. 17 for London. Before returning to the States he will visit Northern Rhodesia to inspect the Roan Antelope and the Mufulira Mines, and will also visit the Tsumeb and O'okiep Mines in Southwest Africa.

Mr. Steele is a director of the Roan Antelope Copper Mines, Ltd., Mufulira Copper Mines, Ltd., and O'okiep Copper Co., and is chairman of the board of Tsumeb Corp., Ltd. The American Metal Co. is a substantial stockholder in these companies.

Frank S. Crawford, mining engineer with the U. S. Bureau of Mines, is now located with the Bureau at Birmingham, Ala. He was formerly located at College Park, Md.

Cutting loose after 32 years with the mining industry of the Pacific Northwest, Mrs. **Margaret Orr** resigned her position as office manager of the Northwest Mining Assn., a position she has held for the past 17 years. Previously she was office secretary with the brokerage house of S. Norman & Co., Spokane, and with the publication *Mining Truth*.

Pearl Elkins, of McRoberts, Ky., has been appointed a Kentucky district mine inspector.

After directing the work of the American Bureau of Metal Statistics since 1921 when the Bureau was first formed to supply statistics covering the production and consumption of the principal nonferrous metals, Dr. **W. R. Ingalls** announced his retirement in December. Prior to the formation of the Bureau Dr. Ingalls was editor of *Engineering and Mining Journal* and a well-known consulting metallurgist. **R. R. Eckert**, secretary-treasurer of the Copper Institute and the United States Copper Assn., will remain active in these capacities and in addition undertake the duties of the director of the American Bureau of Metal Statistics.

In a recent statement, the United States Fuel Co., of Salt Lake City, announced that **S. J. Craighead** is associated with the company as vice president and general manager.

William Leland Husk, formerly chief mining engineer of the Luzerne Graham Mining Corp., Greenville, Ky., has been appointed assistant professor of mining engineering at West Virginia University.

Gailen T. Vandel of Helena, Mont., has resigned his post as chief engineer with Porter Bros. Corp. to become vice president and general manager of Jardine Mining Co. at Jardine, Park County, Mont. The Jardine mine, located near the Gardiner entrance of Yellowstone Park, employs 100 men in the operation of a gold, tungsten, and arsenic property.

G. E. Linkous has been appointed assistant safety director for Island Creek, Pond Creek, Pocahontas, and Marianna Smokeless Coal Companies. Mr. Linkous has had more than 18 years experience in the coal industry, during which time he has served as a federal mine inspector, state mine inspector, plus several posts in engineering and mine production.

Effective Jan. 1, 1948, **Lloyd J. Severson** assumed his new duties as assistant to the general mining engineer of Oliver Iron Mining Co. On his new post Mr. Severson will work under the direction of **Forbes B. Crock**, general mining engineer for the company, and **J. F. Wolff**, assistant general mining engineer.

Mr. Severson brings to his new post a background of experience gained by five years of mining and exploration work in Bolivia plus experience with U. S. Steel, Hibbing, Minn. During the war years he served as principal mining engineer for the Foreign Economic Administration in Bolivia and Spain.

At a meeting of the board of directors, on Jan. 13, 1948, **Clair W. Daniels** was elected assistant secretary of the H. C. Frick Coke Co., and the United States Coal and Coke Co.

James F. Byrnes, former Secretary of State, has been elected a director of Newmont Mining Corp.

Robert U. King, formerly resident geologist with the Climax Molybdenum Co., has left his position there to join the U. S. Geological Survey as a geologist. In his new work he will be making his headquarters at the Denver Federal Center where he will be engaged in work in the trace element section of the Survey.

Henry M. Haskell has recently joined the engineering staff of the mechanical department of Calumet & Hecla Consolidated Copper Co.

Simon D. Strauss, sales manager of American Smelting & Refining Co., has been elected to the board of governors of Commodity Exchange, Inc., at the annual election in New York.

W. F. Wheeler, assistant general manager, Eastern Coal Corp., Stone, Ky., has been promoted to general superintendent of Premier Pocahontas Collieries Co., with headquarters at Premier, W. Va. Before joining the Eastern Coal organization Mr. Wheeler was senior mine inspector for the Kentucky state mine department. **G. Lawrence Runyon**, formerly general superintendent of Premier Pocahontas, has joined the staff of the Eastern Coal Sales Co. as a field representative.

A. E. Petermann, H. Y. Bassett and **A. H. Wohlrab** have been elected vice presidents of Calumet & Hecla Consolidated Copper Co. Robert Livermore although retiring from his post as vice president will continue as a director of the company.

Frank R. Milliken was appointed plant manager of the National Lead Co.'s MacIntyre development, titanium division at Tahawus, N. Y. Mr. Milliken, who has been assistant plant manager, succeeds **Gloyd M. Wiles**. Mr. Wiles is moving to New York City to become chairman of the company's mining committee.

Matthew Turk was recently appointed chief engineer for Pond Creek Pocahontas Co., where he formerly served as preparation plant manager. On his new post he succeeds Mack Largen, who recently resigned.

Russell B. Paul, formerly on the staff of the New Jersey Zinc Co., now resides at 85 North Madison Avenue, Pasadena 4, Calif.

American Steel & Wire Co. announces that effective January 1, 1948, **H. H. "Hal" Bullen**, 208 South LaSalle Street, Chicago, was appointed manager, Western District Electrical Products Sales, for states of Illinois, Indiana, Iowa, Wisconsin, Nebraska, Wyoming, Colorado, New Mexico, Minnesota, Montana, North Dakota, South Dakota, Missouri, and Kansas. Mr. Bullen was formerly assistant manager of the company's electrical, wire rope and construction materials department. He is well known throughout mining circles and is a member of the Board of Governors of the Manufacturers Division, American Mining Congress.

H. H. Bullen

Dr. **James Gilluly**, a graduate of the University of Washington at Seattle, who earned his doctor's degree at Yale, and was principal geologist for the U. S. Geological Survey, and later headed the geology department of the University of California, at Los Angeles, has been elected president of the Geological Society of America, at its recent annual meeting at Ottawa, Canada.

C. S. Lawson, vice president of Sloss-Sheffield Steel & Iron Company, has been elected a director of the company, Hugh Morrow, president, has announced. Mr. Lawson, who entered the company's service in 1915 as a chemist, fills the vacancy created by the resignation of Henry Parsons of New York.

Lawrence Vance is now safety inspector at the Wyoming Mine of the Red Jacket Coal Corp., where he formerly was employed as a section foreman. Mr. Vance replaced **Roy Richardson**, who resigned his post to join the State Bureau of Mines.

G. A. Cowan has been appointed sales manager of the new Celaton products department of the Eagle-Picher Sales Co.

— *Obituaries* —

William H. Nichol, vice president, Enos Coal Mining Co., of Oakland City, Ind., died on Dec. 3, 1947. He was actively engaged in promoting the progress of strip mining for a number of years and was well-known throughout the industry.

E. P. Lucas, president of the Bellingham Coal Mines and the Superior Portland Cement Co., Seattle, passed away on Jan. 19, 1948, in California. Mr. Lucas had been active in the coal industry in the State of Washington for 30 years. His loss will be keenly felt by the entire industry.

Col. **William T. Perkins**, 89, prominently identified for many years with mining and business interests in the Northwest and in Alaska, died on Dec. 22, 1947. Just before the turn of the century, Col. Perkins came to the Pacific Coast and went to Alaska where his interests expanded into the field of mining, both in the Territory and in Siberia. He returned to Seattle in 1908 and subsequently was associated with trading, mining, timber, and banking interests there.

J. R. Flannery, the organizer of the American Vanadium Co. in 1906, and a pioneer in the refining of vanadium, died in Pittsburgh on Dec. 26, 1947, at the age of 68.

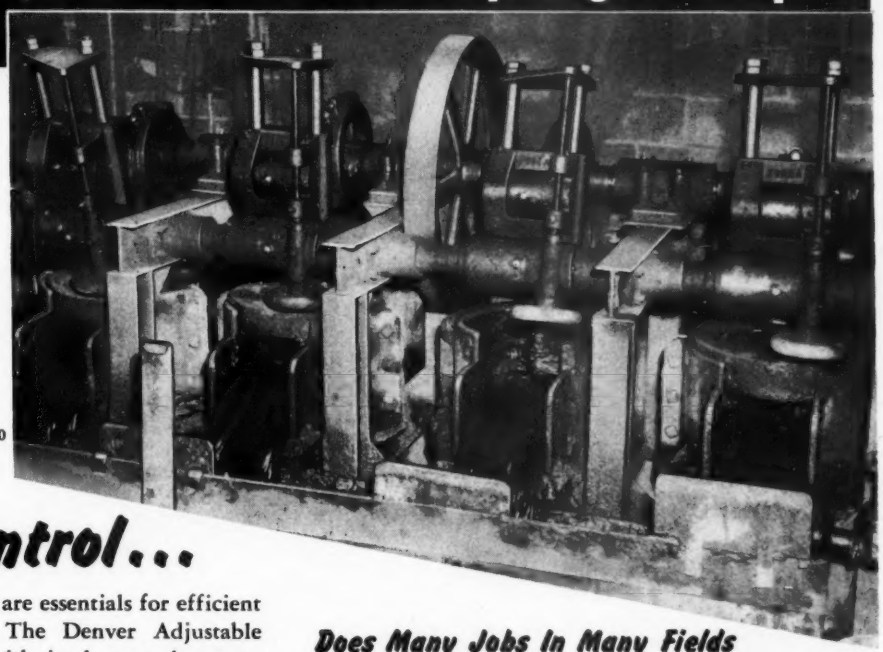
William D. Leonard, who was superintendent of the Garfield, Utah, smelter of the American Smelting & Refining Co. from 1906 to 1917, and who later became president of London Butte Gold Mines in Alma, Colo., died in Denver on Dec. 31, 1947, at the age of 83.

Ernest N. Patty, Jr., son of E. N. Patty, well-known in west coast and Alaskan circles, died in November when his amphibian plane struck a mountain 65 miles from Fairbanks. The fatal accident occurred on the last flight of the season from his father's mining operations at Woodchopper where he was associated with his father. Mr. Patty served with the Army Air Force during World War II and received the Distinguished Flying Cross and other decorations.

Control Large Volumes of Pulp

WITH A

Denver *Adjustable Stroke* Diaphragm Pump



This 6" Quadruplex Denver Adjustable Stroke Diaphragm Pump is doing a real job at the Tamaqua Colliery of the Lehigh Navigation Coal Company, Inc.

Material... Minus 6 mesh washery refuse (Underflow from 75' diameter Denver Hydroclassifier)

% solids in pulp... 35-45
Gallons pulp per min.... 600
Tons solids per 24 hrs.... 1450-2000

Density Control...

... and pulp flow regulation are essentials for efficient industrial plant operation. The Denver Adjustable Stroke Diaphragm Pump, with its large volume capacity, ease of control, and rugged, long wearing construction, is an ideal unit for heavy duty "24-hour service."

Hand Wheel Controls Pulp While Pump is Running

Simply turning the adjustable hand wheel changes the length of stroke and immediately alters the pulp flow to the required amount, *while the pump is operating.*

Rugged Construction Gives Long Life And "24-Hour Service"

The Denver Adjustable Stroke Diaphragm Pump is sturdily built to give trouble-free service. Molded rubber valve seats and diaphragms are long wearing and may be quickly replaced with a minimum of shutdown time.

Does Many Jobs In Many Fields

In coal washing... in copper, phosphate, potash and other concentrators... and in industrial plants... large volumes of pulp are being handled "24 hours per day," month after month with these heavy duty Denver pumps.

Wide Range of Sizes, Large or Small Capacities

Sizes range from 2" to 6" in Simplex, Duplex, Triplex or Quadruplex units.

A 6" Quadruplex Pump, handling 60% solids at 4.2 specific gravity, has a rated capacity of 3,140 tons per 24 hours. A 2" Simplex Pump under similar conditions has a rated capacity of 80 tons per 24 hours.

Let us help you solve your pumping problems. Write today for Bulletin P8-B for additional information on the Denver Adjustable Stroke Diaphragm Pump. Other bulletins also available on a complete line of ore dressing equipment.

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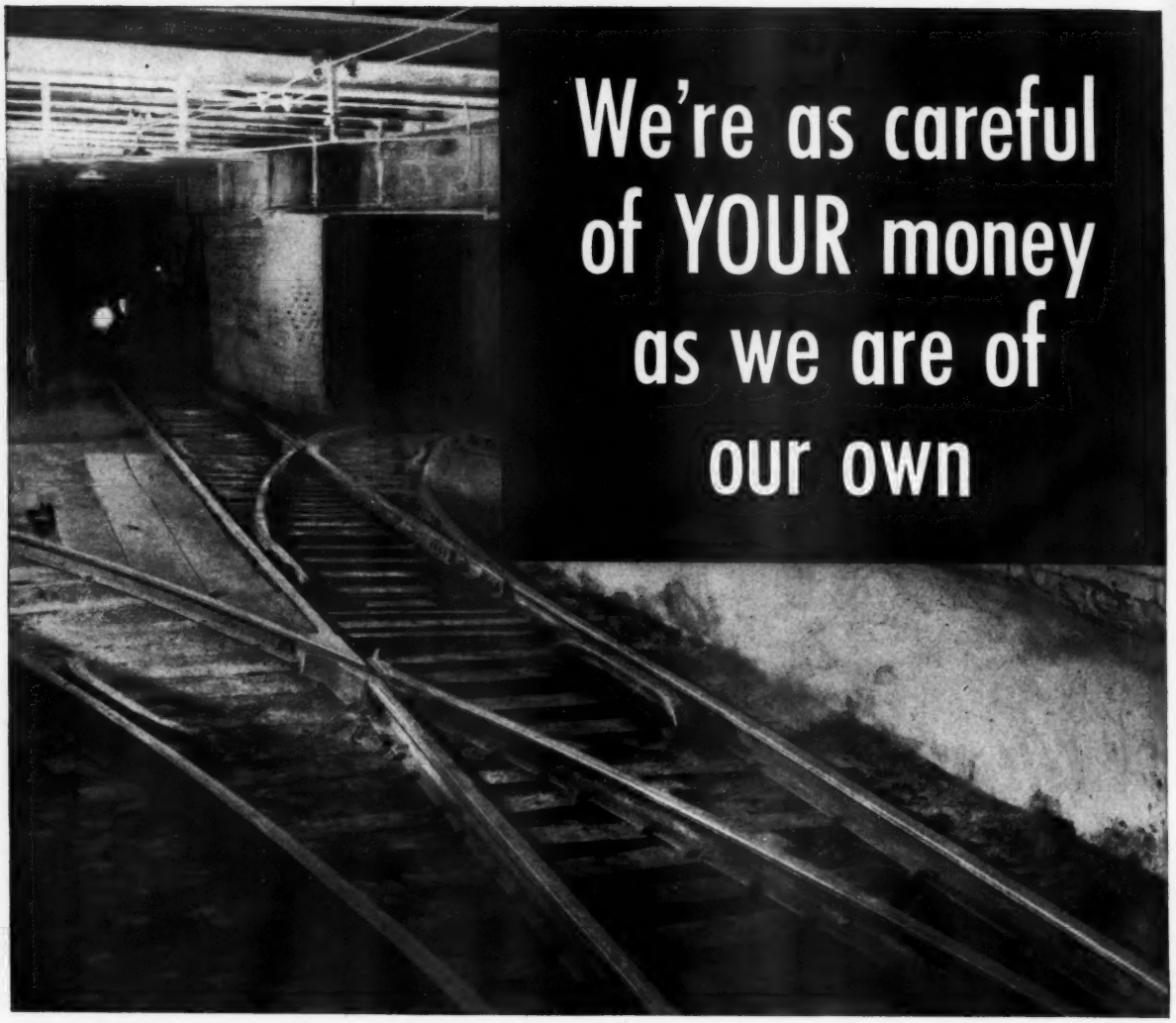

We're as careful of YOUR money as we are of our own

When you ask Bethlehem to design and furnish a prefabricated track layout, you're telling us to go ahead and spend your money. That's what it amounts to. And believe us, we're careful!

A Bethlehem prefabricated system is planned track, made to fit your individual mine. The first step is a detailed study of your workings by a Bethlehem engineer. After this study is completed, he submits a track plan for your approval. It's the layout that, in his opinion, will do the best job for you . . . the simplest layout possible. It is not loaded up with expensive extras.

You'll find, too, that the track he recommends costs little to install. No more than two men are required to handle any of its elements. Parts are match-marked to simplify installation. The number of rail lengths and curvatures is held to an absolute minimum.

A planned system like this means faster, safer haulage; fewer derailments; less inspection and maintenance. All this pays off in lower cost per ton hauled.

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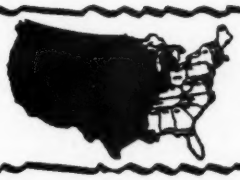
BETHLEHEM PREFABRICATED TRACK

NEWS and VIEWS

Eastern States



New Coal Producer Planned

Construction work is scheduled to begin immediately on a new coal mine designed for a daily production of 5000 tons at Lynch, Ky. The U. S. Coal and Coke Co., a subsidiary of U. S. Steel Corp., already operates two mines in this area and expects to have the new, completely mechanized mine in production early in 1949.

Harry M. Moses, president, U. S. Coal and Coke Co., stated that the normal depletion of coal in the next several years will be met by installation of the new mine. The bulk of the metallurgical coal produced at the Lynch mines is used for the Chicago district operations of U. S. Steel Corp.

Mechanized Mine Scheduled for Completion in 1948

The Chafin-Smith Coal Co. at Huntington, W. Va., is developing a new mechanized deep mine on a 2440-acre tract on Rich Creek in Logan County, W. Va. An up-to-date cleaning plant is included in the plans for the new operation which will have an ultimate daily capacity of 3000 tons. Operations are expected to begin in 1948.

Mead Coal Co. Plant Has Estimated Ten-Year Life

The Mead Coal Co. has opened their East Gulf No. 4 drift mine on the Pocahontas No. 4 seam. The company plans to open a strip operation in April 1948. The life expectancy of the new property is estimated at ten years.. An increase in capacity is planned to bring the daily production up to 4000 tons.

Largest Phosphate Mine

Louis Ware, president, International Minerals & Chemical Corp., recently announced that the amino products plant at San Jose, Calif., is currently approaching full rated capacity. He also added that the outlook for both sales and earnings should show considerable improvement when the new Noralyn mine and refinery near Bartow, Fla., is completed in February. When in full production, this new facility will be the largest phosphate mine in the western hemisphere.

Vermiculite Reserves in North Carolina

In a recent report from the state news bureau in Raleigh, N. C., claims are made that North Carolina has untapped vermiculite resources in at least six counties.

South Carolina has two operating mines near Greenville which are said to be the only active producing sources of vermiculite east of the Mississippi River.

Vermiculite is becoming more and more important as an insulator and as a fireproofing agent. Development of vermiculite in North Carolina should add considerably to the already important nonmetallic industries of the state.

New Jersey Zinc Active in Friedensville

After nearly half a century of no production there is renewed activity in the Friedensville zinc district near Bethlehem, Pa. The New Jersey Zinc Co. of Pennsylvania is sinking a 1250-ft shaft and the plans call for the erection of a modern flotation plant.

Mines in the Friedensville district were discovered about 1845 and the region was responsible for the first zinc production in the United States.

N. C. A. Contacts Students

In the interest of obtaining mining engineers to augment the short supply available for the coal industry, National Coal Association's manager of vocational training has been calling upon faculty members of schools and colleges to make inquiries about those students who will be graduated in June, 1948. M. D. Cooper, who is handling this work, has visited a number of mining schools and faculty members in the western states already and similar visits will be made to the mining schools throughout the country.

Nassau Coal Co. Opens New Mine

Nassau Coal Co. will open its new mine this month under the direction of E. C. Luther, Jr., general manager, and Fred Hubbard, superintendent. The mine is located near Vivian, W. Va.

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Mine Management
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Feldspar Production

The Appalachian Minerals Co. was recently organized to work a feldspar deposit at Monticello, Ga. L. P. Warriner is president of the new organization and B. C. Burgess is vice president and general manager. H. E. Uhland is superintendent of the property. The current production is in the neighborhood of 2000 tons of feldspar per month which is ground to 20 mesh. A plant is under construction for the production of a more finely ground material.

Kentucky Mining Institute Holds Annual Meeting

At the annual meeting of the Kentucky Mining Institute held in Lexington, Ky., Dec. 12 to 13, utilization of coal, grounding of underground electrical equipment and other safety measures, education, and mining facilities were discussed. Representatives from many Kentucky operating mines were present in addition to representatives from the Bureau of Mines.

In a paper on the importance of the coal industry in Kentucky, H. C. Moore, president of the Kentucky Coal Agency in Madisonville, Ky., stated that "in the not too distant future coal will be mined and produced as one of our precious minerals." He urged that immediate action be taken to develop large scale facilities for the production of liquid fuels from solid fuels.

V. D. Picklesimer, general superintendent, South-East Coal Co. was elected president of the Kentucky Mining Institute for the coming year. C. B. Burchfield, general manager, Black Star Coal Corp.; Bradley Sparks, vice president and general manager, Luzerne-Graham Mining Co.; and W. F. Haydon, general superintendent, Hardy-Burlingham Mining Co., were elected vice presidents. Secretary-treasurer for the current year is A. D. Sisk, safety director, Big Sandy-Elkhorn Coal Operators' Assn.

Additional Coal Developed to Supply Power Plant

Two new deep mechanized mines are planned by the West Virginia Coal & Transportation Co., to be located near their present workings. Development calls for production of 1000 tons per day from each mine. A total of some 25,000 acres are to be developed, with the opening of the new mine scheduled for the summer of 1949. The production from the mines will be used at the new power plant of the American Gas & Electric Co. which is being erected at Graham Station, W. Va.

New Coal Washers Planned

The 1948 schedule of the Robena mine of the H. C. Frick Coke Co. calls for installation of several new coal washers which will be placed in operation in the third quarter of 1948.

Weather Curtails Coal Production

During January, when traffic on the Monongahela River was brought to a near standstill by severe ice conditions, many mines were forced to close. U. S. Steel Corp had five mines closed by Jan. 30, with a coal production loss of about 25,000 tons daily. Jones & Laughlin Steel Corp. closed Vesta No. 4 mine and at month's end anticipated closing Vesta No. 5. These two mines produce about 14,000 tons of coal daily. Many other producers were hard hit by severe cold with the ice and snow hampering transportation.

Drift Mine Opens Near Oral Lake

The Virginia & Pittsburgh Coal & Coke Co. recently opened their new Hebb drift mine near Oral Lake. The operation is on the Pittsburgh seam and 400 tons per day is the planned production.

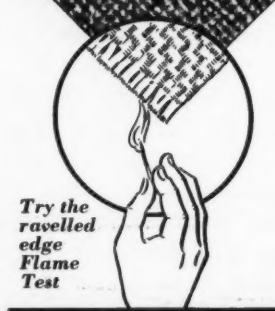
Consolidation Coal Co. Reports Personnel Changes

The Consolidation Coal Co. (W. Va.), recently announced the following changes in their supervisory organization. At Mine No. 63, Monogah, M. H. Ireland and Lloyd L. VanPelt have been promoted to the position of section foremen. At Mine No. 93, Jordon, John J. Konkoly and C. V Rowand have been promoted to section foremen. A. B. Conrad has been promoted to dispatcher and W. L. Reynolds has been promoted to tipple foreman. Albert Powell has been promoted to assistant mine foreman. At Mine No. 98, Nora, O. F. Allen has been promoted to the position of mine foreman. Edgar L. Zuspan has been promoted to assistant mine foreman and E. W. Heldreth has been appointed section foreman.

The Consolidation Coal Co. (Ky.), has announced the following promotions: Edgar Wright to assistant maintenance foreman at Mine 204 and Victor Mullins to maintenance foreman at Mine 204. At the Clover Splint Mine, Clyde White has been promoted to chief engineer and gen-

FULTON'S
FAMOUS FIREPROOF
BRATTICE CLOTH

AN INTEGRAL ELEMENT
IN SAFE MINE VENTILATION



Try the ravelled edge Flame Test

Use this close woven jute fabric with the famous Fulton non-inflammable treatment. It is mildew, fungus and rot resistant. Fulton's even grade, lasting qualities and economy are well established. FULTON Brattice Cloth is made in two weights; widths from 36 to 96 inches. Immediate shipments are available from stocks of leading mine supply houses in all coal fields.

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Manufacturers Since 1870
ATLANTA ST. LOUIS NEW ORLEANS DENVER
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eral outside foreman. Charles R. May, has been advanced to section foreman and Neely C. L'Argent, has been promoted to strip mine superintendent at Mine 155. At Mine 207, Lester Flint has been transferred to the Hill Mine and assumes his new duties as maintenance foreman there. Also at the Hill Mine, Wilson Harrison has been promoted to foreman. D. A. Zegeer has been promoted to mine engineer at Mine 204. C. C. Dorton, formerly a section foreman at Mine 214, has been promoted to assistant mine foreman.

Alabama Slope Mining Began 60 Years Ago

Although iron ore was mined in the Birmingham district at an earlier date, the first slope mine for iron ore production was driven into Red Mountain at Birmingham, Ala., in 1888. After the introduction of the slope mining method, iron mining became of considerable importance to the Pittsburgh of the South.

Certainly the district has every natural geographical advantage for a producer of iron and steel. Both coal and limestone are mined in the near vicinity of the iron ore mines and it is often said that within 48 hours after the iron ore is mined it has been transported to the furnace, melted into pig iron, and is on its way to further refinement and subsequent manufacture into finished products. The mild climate enables year-round operation of Alabama's iron ore industry.

Each year Alabama produces about 6,000,000 tons of iron ore and is the third ranking iron ore producing state in the Union. Nearly 90 per cent of Alabama's iron ore comes from underground mines. The iron ore is of low grade but reserves are extensive. Some of the Alabama ore is practically self-fluxing due to its high lime content. The average iron content of the raw ore is 36.43 per cent.

The Muscoda, Ishkooda, and Wenonah mines of the Red Mountain group, together comprise the fourth largest producing iron mine in the United States and account for the majority of the iron ore mined in Alabama.

Portsmouth Steel Acquires Kentucky Coal Mine

Acquisition of the coal operation of Tierney Mining Co. at Stone, Ky., at an undisclosed price, was announced by Elmer C. Schwartz, president of Portsmouth Steel Co.

The mine, with a rated output of 1500 tons a day, will be operated along with another recently purchased mine at Freeburn, Ky., by the Black Gold Coal Corp., a subsidiary, "to assure a constant supply of coal for coke."

The sale includes mining equipment, power substations, a five-track tipple, trackage, store and office buildings and dwellings at the Tierney mining camp.

The purchase also provides Portsmouth with a "considerable area" of undeveloped coal lands, Mr. Schwartz stated, but no equity in Tierney Mining Co. which has other operations.

FOR SALE

Sample Bargain—600 3½-Ton End-Dump Mine Cars

Height overall—46".	Steel bodies—3/16".
Length of body—9'.	Draw bar—1" x 4".
Overall length—10' 2".	Oak bottoms—3¾".
18" Timken roller bearing wheels.	3—Link couplings.
Wheel base—36".	3—Binders.
Width—60".	Spring draw head one end.
Axles—3".	Track gauge—42".

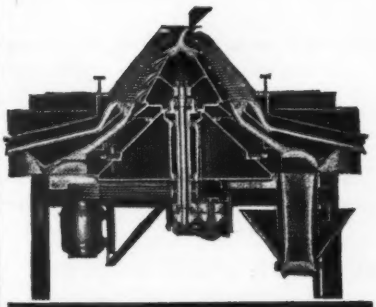
We supply everything used in coal mines: Locomotives, Cutting Machines, Loading Machines, Substations, Tipples, Hoists and miscellaneous equipment.

We specialize in buying complete mines that are going out of business or from receivers in bankruptcy, administrators of estates, etc.

COAL MINE EQUIPMENT SALES COMPANY

FRANK J. WOLFE — SHELDON J. WOLFE

306-7 Beasley Building. L.D. Phone 34. Terre Haute, Ind.



"C-M-I"

CONTINUOUS CENTRIFUGAL dryer

reduces the moisture content of the smaller sizes so low that troubles caused by clogged cars, spouts and chutes are eliminated and the product is also suitable for blending. Users tell us that by the installation of these "C-M-I" dryers they have kept their customers satisfied and also expanded their markets.

CENTRIFUGAL AND MECHANICAL INDUSTRIES, INC.

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Central States

New Pumps to Dewater Garrett Shaft

Since the first of the year, the Lavrion Mining Co. has begun the installation of three large Byron Jackson submersible pumping units at the Eagle-Picher Garrett shaft which is located three miles north of Treece, Kans. The cost of the installation is expected to run in the neighborhood of $50,000. Each of the three pumps has five stages and will deliver from 2000-3000 gpm depending upon the static head of water. Clarence Zuvekas of Joplin is owner and operator of the property. The installations are being made under the direction of Jack Gilbert, general sueprintendent, with the assistance of John A. Nicholson, Jr., of Houston, Tex., who is the installation supervisor for the Byron Jackson Co.

Test drill holes on the property include nine holes put down by Zuvekas and five drilled by the U. S. Bureau of Mines. Over-all assays show an average of five to six per cent in recoverable values of zinc and lead. Mineable ore to the extent of 375,000 tons is reported to have been blocked out by drilling; an additional 500,000 tons of ore are possible according to Mr. Zuvekas. The ore is located in a sheet-ground formation at a depth that ranges from 435-540 ft. Ore produced from the development is to be shipped to the Eagle-Picher Central mill at Cardin for treatment.

Calumet & Hecla Puts New Furnace in Operation

For the smelting of secondary copper, a new furnace has been placed in service at Calumet & Hecla Consolidated's smelting plant in Houghton, Mich. The bricks used in the furnace are composed largely of magnesite and chrome and contain no silica.

Tri-State Mine Closes

An open-pit mine, known as Sucker Flats mine, located in the south-central part of Webb City, has been closed. The operator of the property, F. W. Evans of Joplin, says harassing damage suits have forced this action. Numerous suits have been filed by persons residing in the immediate vicinity of mine because of damage they charge has been caused by the blasting done in the mining operations.

Loading Facilities at Presque Isle Improved

Nearly $2,000,000 is being spent by the Chesapeake & Ohio Rwy. Co. to improve its Walbridge yard and Presque Isle docks at Toledo, Ohio. This improvement will enable faster dumping of coal into Great Lakes vessels and speedier return of empty coal cars to the mines.

Included in the installation are 15 car retarders, 53 power-operated switches, and 106 power and hand-operated skates for stopping cars not properly retarded. The new facilities will permit faster classification of the coal and will prevent delay in loading lake vessels. In 1947, almost 17,000,000 tons of coal were handled at Walbridge for dumping at Presque Isle docks. Prior to the war an average of about 11,000,000 tons a year were handled.

The new installation was begun in May 1947 and is scheduled for completion June 1, 1948.

Preparation Engineers Elect Officers

New officers of the Illinois Society of Coal Preparation Engineers & Chemists were elected as follows: J. Laning Dress, president, preparation manager, Binkley Coal Corp., Du Quoin, Ill.; Walter A. Hamilton, vice president, mill superintendent, Rosiclare Lead & Fluorspar Co., Rosiclare, Ill.; Howard Stelzriede, vice president, preparation manager, C. W. & F. Coal Corp., West Frankfort, Ill.; and Carl E. Campbell, secretary-treasurer, industrial engineer, Shell Oil Co., Illinois area. Meetings for the Society during 1948 will be held on the third Friday of each month at Benton Country Club, Benton, Ill.

DIG and HAUL
the **SAUERMAN** *Way*

Picture shows how a Sauerman Power Scraper at nickel mine in Canada digs into hill and moves material down to a raise to backfill a worked out stope.

You can move any loose materials—coal, ore, sand, gravel, clay—fast and efficiently with a Sauerman Power Scraper. One man handles the entire operation through simple automatic controls. Operating range is easily extended. Sturdily built for long, low-cost service. Electric, gasoline, Diesel or steam power.

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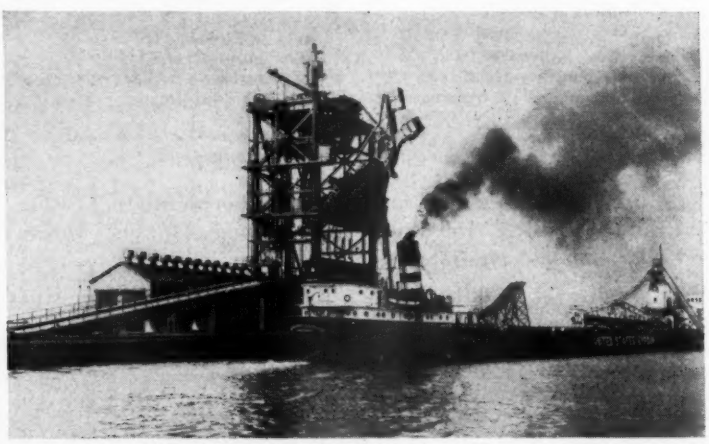


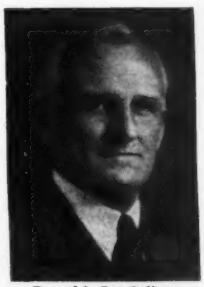
The new four-million-dollar coal dock built by the Baltimore and Ohio Railroad at Lorain, Ohio, after a test loading operation of a lake vessel. The dock, just completed, will be open for the Great Lakes shipping season in the spring of 1948

World-Famous Engineer to Devote Entire Time to Mining

ALTHOUGH Donald B. Gillies, who celebrated his 75th birthday on Nov. 4, 1947, has resigned as vice president and director of the Republic Steel Corp., he will continue with Republic as advisor and consultant, devoting his activities wholly to the mining activities of the company.

Mr. Gillies has been active in mining and steel industries for 55 years and has been directly responsible for many important developments. His efforts were instrumental in the re-establishment of the North Adirondack region and its development as an important source of iron ore. Among his recent activities was the part he played in the acquisition of an iron ore mine in Mexico for his company.

All the world recognizes Mr. Gillies as an authority on mining. Hard work and broad experience gave him the background which made his knowledge useful and valuable to his company. He began his professional career in 1893 shortly after graduation from the Michigan Mining School, now Michigan College of Mining and Technology. His first employment was near Butte, Mont., where he pushed a slag pot at a copper smelter. Shortly after he was working as mining engineer at the Senator W. A. Clark property in Butte. He became manager of the Clark properties and discovered and developed the Mayflower mine which produced many millions before exhaustion. He spent several years in the Tonopah and Goldfield districts during the period of their greatest activities. After a period of varied service in mine management in Mexico he accepted the management of the Corrigan-McKinney properties in Mexico. Despite the political upheavals in that country Mr. Gillies operated his properties without interruption in the shipment of copper, silver and lead ores.



Donald B. Gillies

In 1939 Mr. Gillies was honored by being elected president of the AIME, an organization in which he has taken an active part throughout his professional career. He was recently elected president of the Lake Superior Iron Ore Assn.

All of the mining industry looks towards Donald B. Gillies as an able engineer and capable executive. He has set enviable records of accomplishment to serve as a guide and inspiration to the younger men of the industry.

Illinois Coal Operators Elect Officers

At the Eighteenth Annual Meeting of the Illinois Coal Operators Assn. held in Chicago on Jan. 21, 1948, the following were elected as members of the executive board: J. Roy Browning, D. W. Buchanan, D. H. Devonald, George B. Harrington, Hubert E. Howard, E. R. Keeler, T. C. Mullins, T. J. Thomas, A. H. Truax, William P. Young. During the coming year the following officers will serve the Illinois Coal Operators Assn.; George F. Campbell, president; J. Roy Browning, labor commissioner; Fred S. Wilkey, secretary; and Thurlow G. Essington, general counsel.

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Mather Shaft Sinking

Now at a depth of 400 ft, the future vertical production shaft on the Mather iron ore properties, Ishpeming, Mich., will ultimately be connected with the No. 1 shaft which bottoms at a depth of 2350 ft.

Research Laboratory Scheduled for Completion in 1948

The U. S. Steel Corp. recently announced that the new research laboratory designed to test suitable methods of beneficiating the low grade ores of the Mesabi Range is scheduled for completion during the second quarter of 1948. This new laboratory at Duluth and the pilot plant at Trout Lake at Coleraine, Minn., will be under the direction of the Oliver Iron Mining Co.

Wheels of Government

(*Continued from page* 124)

out a joint arrangement. Stating that he would vote against the project, Senator Taft declared he is opposed to any large increase in public works spending at this time.

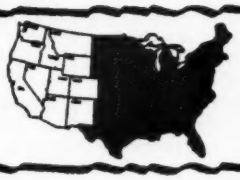
The Senate has agreed to vote on the St. Lawrence resolution February 27 but its supporters are already understood to consider it a lost cause.

Synthetic Fuels

An increasingly important synthetic liquid fuels program has been given real support by recent House and Senate passage of a bill extending this activity to April 5, 1952, with an authorized total expenditure of $60 million. Originally the 1944 Synthetic Liquid Fuels Act established a 5-year program with an expenditure of $30 million. Important research on a large scale is being conducted by the Bureau of Mines in production of liquid fuels from coal and oil shale.

In late January a report by the Secretary of the Interior emphasized the future magnitude of a synthetic fuels industry adequate to compensate for any future deficiency in domestic petroleum requirements. As a preliminary estimate the report indicates that a production of 2,000,000 barrels of synthetic liquid fuel a day (less than 40 per cent of current daily consumption) would require the use of 16,000,000 tons of steel and the expenditure of about $9 billion. The report calls for construction of commercial plants to process oil shale and coal, as models to be followed by further widespread construction as soon as practicable.

Western States



New Mexico Miners and Prospectors Association Meets

On Jan. 10, 1948 at a meeting of the New Mexico Miners and Prospectors Association held at Carlsbad, N. M., a declaration of policy was formally adopted.

Among the points on which the association members took a firm stand was the opposition to the expansion of the Federal Government leasing system to include public lands containing metallic or nonmetallic minerals. They urged strict adherence to the Mining Act of May 10, 1872, as the law which has gone a long way to further the development of this country. They also opposed all efforts to nationalize any kind of mining and prospecting of mineral resources. The statement was made that, in order to encourage mining development, lower freight rates on western ores and concentrates are necessary. The association endorsed and concurred in the taxation provisions of the Declaration of Policy of the Western Division of the American Mining Congress.

Among other points the association favors the confirmation of Dr. James S. Boyd as director of the U. S. Bureau of Mines.

United Verde Finds New Ore

The discovery of a mineralized area in the United Verde mine of Phelps Dodge Corp., Jerome, Ariz., has been announced by H. M. Lavender, vice president and general manager of the corporation. The recent discovery lies just above the 4500-ft level.

"We have been exploring the lower elevations at Jerome for the past four years," Lavender said in making the announcement. "About two months ago we ran into a small mineralized area which is economically feasible to mine at present prices."

Plans to abandon the United Verde, because of exhaustion of ore reserves, originally had called for the cessation of operations by Jan. 1, 1947. At that time copper was selling at 12¢ to 14¢ per lb and production costs were mounting rapidly. However, with the removal of price controls, copper advanced to its present level, making further clean-up work possible, and in the meantime underground exploration was continued. It is believed that the ore body just located will make it possible to extend the life of operations for another year with the continuation of present copper prices.

When Phelps Dodge Corp. purchased the United Verde mine in 1935, ore reserves were estimated as being sufficient for only three or four more years of production. However, consistent exploration and development work has made continuous production from the mine possible and its output of copper during the war was a major contribution. The recent discovery will give both the mine and the town of Jerome a new lease on life.

New Record in Safety

During 1947, workers of the Winton mine of the Union Pacific Coal Co. put in over 600,000 man hours without an injury. Since the record shows that the highest man hour record without injury for any coal mine since safety competition was originated in 1925 was 339,156 man hours, reported in 1936, the Winton mine has achieved a new high. The runner-up to the Winton record was the Superior mine with a total of 265,014 man hours per injury.

End of Premium Payment Stops Work at Country Boy

No longer able to realize a profit on ore production, the Country Boy high-grade zinc mine at Breckenridge, Colo., has closed down all operations as of Jan. 10, 1948. It is reported that a large tonnage of undeveloped zinc ore has been left which can never be recovered under present economic conditions.

Higher Gold Price Urged

At the 21st annual meeting of the Mining Institute of the School of Mineral Engineering, University of Washington, it was agreed that a higher gold production must await another revaluation of gold. Most of the men at the meeting believed that putting gold coins back into circulation would be of considerable help.

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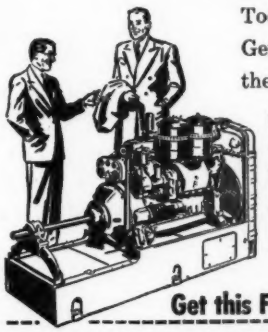

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GENERAL MOTORS

It was stated by O. H. Solibakke of the Cariboo Gold Quartz Mining Co., "that Canada is producing only half as much gold as it did before the war."

Ernest N. Patty now operating gold dredges in both Alaska and the Yukon territory stated that "Alaska's gold production is only one-third of what it was before the war."

Favorable Decision Made on Mining Claim in National Forest

A precedent-setting decision was handed down by director, Fred W. Johnson, of the Bureau of Land Management, U. S. Department of Interior, on Jan. 9, 1948, when he dismissed a U. S. Forest Service protest against the issuance of a mine claim patent and ruled in favor of the claim holder, J. Reed Denison.

The decision affirmed a ruling of Thomas F. Britt, acting manager of the Phoenix, Ariz., land office, and states that the regional forester's protest that the land in question was of greater timber value than for mining purposes does not prevent issuance of a patent.

The case involved nine manganese lode mining claims in the Coconino National Forest, Coconino County, Ariz., which Denison sought to patent.

An abstract of the decision, prepared by Donald J. Morgan, Prescott attorney for Denison, gives the following outline of facts:

In 1945, Denison filed application for patent to the nine manganese claims mentioned. After all papers had been approved by the Land Department and patent authorization issued, the regional forester filed protest against the application. He claimed that the land was non-mineral in character, that it was of greater value and chiefly valuable for the timber thereon, and that the applicant was not seeking in good faith to acquire the land for bona fide mining and milling purposes.

The case was heard before Britt early in 1947, and on May 19 he rendered his decision, recommending that the charges be dismissed and that the final certificate for patent be issued. From this decision the Forest Department took an appeal to the director at Washington.

Testimony at the hearing had disclosed that although there was a valuable stand of ponderosa pine on the ground sought to be patented, Denison had operated the claims in the years 1942 to 1945, inclusive, at a profit. Witnesses for Denison included Charles H. Dunning, director, and A. C. Nebeker, mining engineer, Arizona Department of Mineral Resources.

According to Morgan, the director's decision plainly and unequivocally gives the law on the subject and should have the effect of preventing protests, except in cases where there has been no valid discovery of mineral or the mineral is not of a quantity and value to warrant a prudent person to proceed in the expenditure of time and money in the development of the mine. In the Denison case, he held that the evidence clearly showed that Denison was making the application in good faith and for mining purposes.

Although the law authorizes the location and patenting of valid mining claims within the National Forest, mining men state that it is the practice of the Forest Department to protest when patents are sought. As a result much time has been lost and expensive litigation required to protect the right to patent, they state, and owners of mining deposits within the boundaries of the National Forest have been discouraged in attempting to develop their mines or secure patents thereof.

THE Leahy HEAVY DUTY

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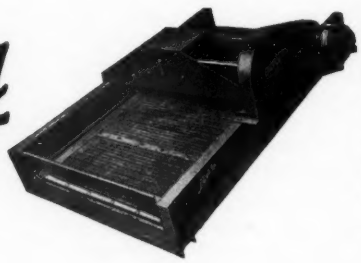

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Screen jackets are changed in five minutes' time and upkeep costs are negligible.

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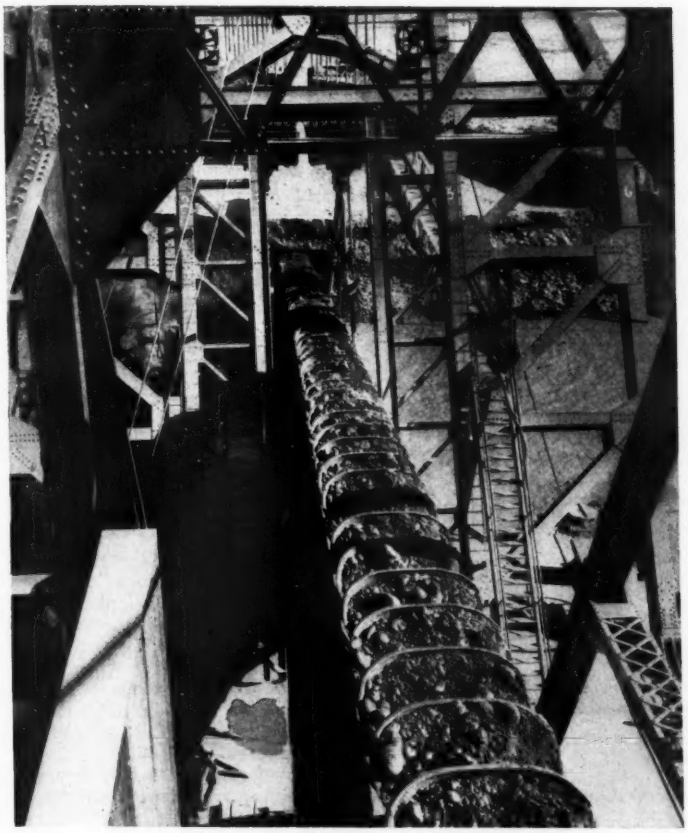

This photograph of the bucket-line of YCGF dredge No. 20 was taken from the winch room looking down the loaded buckets. When this picture was taken the bucket-line was entirely out of water. The operating principle involved is for the dredge to start swinging cuts against top of the bank, out of water. On each swing the ladder and bucket-line are lowered a few inches to keep the buckets full of gravel. Eventually on each cut, the bottom of the pond is reached. The digging ladder is raised then and a new cut started after the dredge is stepped ahead.

YUBA DREDGES — PROVED DEPENDABILITY ROUND THE WORLD

Placer dredging in California today is an industry of nearly fifty years standing. The design of dredges and their component parts therefore is an art based on long experience. Basic dredging principles are the same today as when early California Fields were being dredged. Improvements came with experience and details of the modern dredge are the composite results of thousands of changes, trials and tests.

Yuba's association with placer dredging has been constant since the early successful dredges were built in California. Much of the modern dredge design originated with Yuba's staff while working with dredge operators developing new and better ways to dredge placer ground.

Specially designed Yuba dredging equipment built by experienced craftsmen is in use in practically every dredging field of the world. Simplicity of design and rugged strength of parts, subject to wear, are factors which contribute to long life and running time. When replacement parts are necessary they must fit and be readily installed. Yuba dredge parts are all carefully indexed by number making sure that when ordered the right parts will be furnished and will fit. If you have a Yuba dredge, even though it has changed hands several times, it is possible to furnish new parts and usually on short notice.

Such dredge parts as alloy steel bucket pins, Abrasion Resisting Steel (ARS) perforated screen and liner plates, forged alloy steel tumbler wearing plates, shafts and many others can be made from stock on hand in large quantities at Yuba's plant in Benicia. *Why buy from random sources when genuine Yuba parts can be secured at no greater cost?*

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In addition to the unprecedented demand for nails today, there are other factors affecting the shortage in the Midwest and Southwest. Some mill-owned warehouses in this territory have been discontinued and some faraway producers have been obliged, for economic reasons, to suspend business on nails in this area. This places a heavier burden on our customers and us alike.

Today, Sheffield Steel Corporation is making more nails than ever before in the history of its business—in a sincere effort to supply the heavy demand.

We are following the time-proven method of distribution through established channels. Our nails are being sold only to legitimate, reputable distributors and dealers—at our regular market prices.*

There undoubtedly is a "gray market" on nails throughout the United States, but it is less prevalent in the Midwest and Southwest than elsewhere. To prevent the territory which we serve from contributing to this serious situation, we ask all of our customers not to sell nails at other than regular established prices. We implore users of nails in this area not to pay anyone more than legitimate established prices. Let's all do our part, by distributing nails wisely in our own territory. Don't let the "gray market" rob the Midwest and Southwest.

*This policy applies to all Sheffield products, listed below.

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Mine Safety in Montana

An organizational meeting was held by representatives of the mining industry of Montana in Butte on Jan. 11, 1948, with the object of setting up a mine safety program in a statewide plan. The regional meetings will be patterned after those held by the Lake Superior Mine Safety Council. Officers of the newly organized Montana Section of the National Safety Council are: W. H. Myers, president, U. S. Grant Mining Co., Virginia City, Mont.; W. P. Shelledy, vice president, president of Montana Phosphate Products Co.; O. A. Dingman, secretary-treasurer, Montana School of Mines; John L. Boardman, general chairman, chairman of the Bureau of Safety of the Anaconda Copper Mining Co.

Speedy Completion of Tunnel Planned

The Rock Creek Mining Co., a subsidiary of Hecla, has started a deep tunnel development on Rock Creek in the southside silver belt midway between Wallace and Mullan, Idaho. This tunnel will be 3000 to 5000 ft in length and will prospect a block of ground two miles square at a depth of 800 ft below the surface and will give the company information as to where to locate deep shaft development. The tunnel will be driven at a speed that is aimed at beating all former tunnel records.

The management proposes to employ four 6-hr shifts and blast two 5-ft rounds to a shift, hoping to establish an advance of 30 to 40 ft per day. The operation is highly mechanized. The company recently completed a shallow shaft operation on another part of the property where records were made in drifting and crosscutting.

Northwest Mining Assn. Meets—Sound Economy, Free Enterprise Advocated

Almost 500 delegates attended the two-day session of the annual meeting of the Northwest Mining Assn. at Spokane, Wash., in December, where foremost of ten notable resolutions adopted was the Hard Money Resolution.

The Hard Money Resolution of the body took the position of being opposed to the lending of large sums of money to foreign nations, European as well as Asiatic, until "sound currency systems based on gold and silver" were established throughout the world. Headed by Chairman J. J. Curzon, the active resolutions commit-

tee put opinions of leading mining men down in black and white. They staunchly upheld the American way of free private competitive enterprise and declared that a strong prosperous mining industry is essential to a sound domestic economy.

Diamond Drilling at Old Dick Mine

Forty tons of zinc ore are being mined daily at the Old Dick mine, located in the Eureka Mining District of Yavapai County, Ariz. The mine is being worked under an agreement with the Hillside Mining Co. and the ore is trucked to the Hillside mill for treatment. The Old Dick is located about 72 miles west of Prescott and is owned by the Lawler Estate. It has been developed by a 75-ft shaft and a 200-ft crosscut tunnel to the vein. Several diamond drill holes are to be driven to prove the downward extension of the ore. Mark Gemmill of Prescott is manager and Harman Swadley of Bagdad, Ariz., superintendent.

Pinos Altos Plans Shovel Mining

Recently the Pinos Altos Mining Co., N. Mex., a Delaware corporation, acquired the Homestead Mining Co.'s holdings. Development has been planned for over an area of 400 acres of claims containing values in copper, gold and silver. A 100-ton flotation mill has been purchased to treat the ore. Plans call for handling a large ore tonnage by modern shovel methods.

Tungsten Operation in California

The Bishop Concentrate & Cleaning Co. is handling four tons of tungsten concentrates per 8-hr shift in its custom concentrate cleaning plant. Plans have been completed for enlarging the old mill to handle additional quantities of custom tungsten ore.

At the Black Rock mine a small group of men are producing 40 to 50 tons of tungsten ore per day, which is being milled at the El Diablo Mining Co.'s mill near Bishop, Calif.

Exploration Work Begun on Old Property

Exploratory work has been started in the Naildriver property, situated in the eastern end of the Park City mining region of Utah.

Work is being conducted through the adjoining Park City Utah Mines Co. property on the 1100-ft level. The Naildriver has been closed down for more than 30 yr. Prior to that time a shaft was sunk to a depth of 950 ft and the company has a production record of $100,000 worth of ore.

Park Utah Consolidated Mines Co. is the largest individual stockholder in Naildriver, owning about 105,000 shares of a total of 287,000 outstanding.

Opaque Mineral "Finger-printed"

George H. Neuerburg, instructor in the department of geology at the University of Idaho School of Mines, has discovered the missing link, the "finger-print" of opaque minerals.

About 90 years ago, according to the announcement, scientists studying transparent minerals discovered that different minerals produced different markings or designs not visible to the naked eye which identified the particular mineral. Such a result was not possible with the opaque mineral family, such as magnesium, galena, or pyrite. While using an ordinary reflecting microscope equipment in a study of a specimen of covellite, Neuerburg discovered an optical figure.

Neuerburg's discovery brings us to the same point with opaque minerals that we were with transparent minerals 90 years ago. The possibilities for further research and development are almost limitless.

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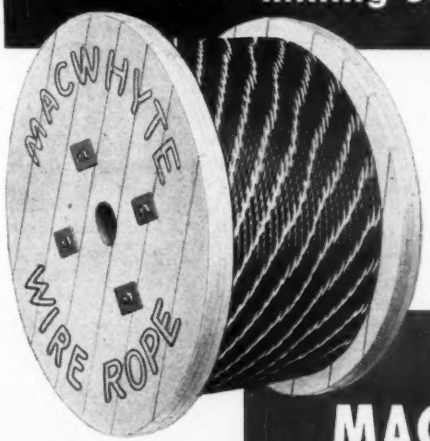

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Jeep-Mounted Diamond Core Drill

The Penndrill Jeep is a new, light, mobile diamond core drill mounted on a jeep. It goes anywhere quickly, moving the tools and auxiliary equipment on a two-wheel trailer behind it. The four-wheel drive, low, low gear range, short wheel base and narrow gauge mean easy transportation through woods and over rough ground. The drill is rated at 450 ft of NX hole and is driven by a jeep motor. Double transmission gives multiple speed range. It is equipped with aluminum mast easily raised by one man, and has a hydraulic swivel head with built-in oil circulating system. The manufacturer also claims that the jeep can be used as tractor and mobile power winch for moving auxiliary equipment on the job. When drill is idle it can be removed in a short time, thus releasing jeep for general use.

The Penndrill Jeep was developed by the Pennsylvania Drilling Co. of Pittsburgh for their own contract work to meet a need for a fast drill for shallow holes, and is now being manufactured and marketed for those who desire to do their own prospect drilling.

"Air-Pak" For Use in Unbreathable Atmospheres

The Scott Aviation Corp., Lancaster, N. Y., has announced a new model of their self-contained breathing equipment; the Senior Sling Pak, Model 6000-B4.

According to the producer, the light and snugly fitting body contours permits entry into unbreathable atmospheres through extremely small manholes or doors. It provides a minimum of 15 min use at extreme exertion and is supplied in a carrying case with provision for a spare cylinder. It is said to be instantly ready for use; each inhalation provides all the air demanded by its wearer, regardless of age, physical condition, or lung capacity.

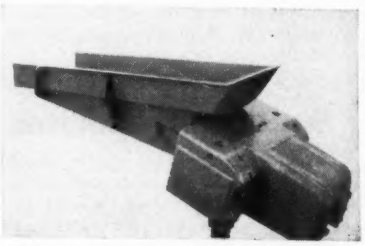
Big Coal Barges Ordered

Receipt of an order for construction of eight "jumbo" coal barges to be operated on the Illinois River has been announced by Dravo Corp., Pittsburgh. Each barge will be 195 ft long, 35 ft wide, 11 ft deep, and capable of carrying 1500 tons of coal per trip.

Dust-Tight Feeder Available

The Jeffrey Manufacturing Co. (Jeffrey-Traylor Division), Columbus, Ohio, announces an electric vibrating feeder with a newly designed enclosed power unit for use in installations where the material to be handled is magnetic, hot, dusty, and abrasive.

In addition to being dust tight, the unit is also provided with air inlet and outlet features so that a stream of air may be circulated through the motor and if necessary build up a slight interval pressure which would act as a double insurance toward keeping the dust out. The value of this new unit will be appreciated by users of electric vibrating equipment in sintering plants, foundries, slag plants, and many other operations where the atmosphere carries a lot of hot magnetic float dust.



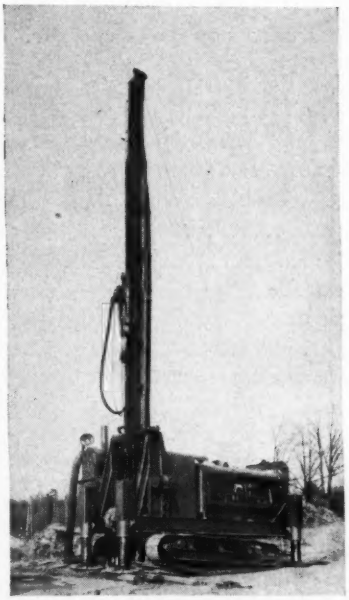
Goodman Adds Factory Space

Keynoting activities for 1948 by the Goodman Mfg. Co., Chicago, is the enlarging of factory space through the acquisition of a nearby plant, and the construction of an addition to the main plant. This double expansion has added over 100,000 sq ft of floor space, with production of mining machinery already under way in the acquired property

Ingersoll-Rand Announces Quarrymaster

In answer to a long-felt need for a blasthole drill that would provide more economic operation and the advantages of positive feed, controlled rotation, and continuous hole cleaning, Ingersoll-Rand mobilized its entire facilities and tackled the problem. The result of their efforts is a self-propelled, self-contained rock drill called the "Quarrymaster," which is essentially built up of components that have been time tested in field operations.

The "Quarrymaster" is an integral unit mounting a diesel engine and a 500 cu ft air compressor which can be powered with gasoline, diesel, or electric motor drive. The generously-sized crawlers are powered by Ingersoll-Rand air motors to move the "Quarrymaster" from place to place.



Sufficient power is provided to move the entire unit up grades not exceeding 30 per cent. The hydraulic system operates four independently-controlled jacks that are used to level up the machine when it is desired to drill parallel holes. Mounted on the tower is the heart of the "Quarrymaster," an air-operated, piston-type rock drill that strikes more than 200 blows per min. This six-inch cylinder diameter rock drill has a patented valve action and power cycle to insure maximum efficiency and drilling speed. Although it is the only new component of the "Quarrymaster," its design is based upon the time-proven, steam-operated submarine drill. A feed chain, driven by an air motor, provides automatic feeding of the drill. Holes can be drilled up to 6 in. in diameter and up to 70 ft in depth.

Automatic rotation is so controlled that the bit cuts at a certain predetermined point each time a downward stroke is made. In combination with an unusual arrangement whereby the exhaust air from the drill is blown into the hole and a motor-operated dust collector is placed over the collar, cuttings are removed to permit the bit to strike a clean surface with each blow. Thus the "Quarrymaster" is truly a rock-cutting machine.

To see this new drill in operation is an impressive sight as it drills through hard blue limestone at a rate exceeding 13 ft per hr. Simplicity of operation with a two-man crew, in combination with its many other advantages, makes the "Quarrymaster" worthy of the serious investigation of those interested in strip, open-pit mining, and quarrying work.

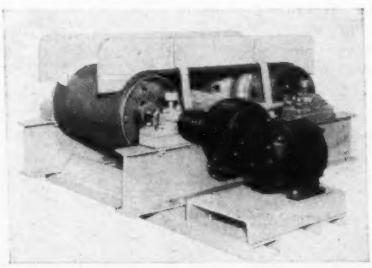
Friction-Free Barometer

A new series of precision barometers is now being manufactured by the American Paulin System, 1847 So. Flower St., Los Angeles. These new barometers were designed and engineered for extreme accuracy and sensitivity. The outstanding instrument in the new series is the PB500 that is graduated in intervals of 1/500 in of mercury. American Paulin System's system of instrumentation is said to eliminate all friction-creating mechanisms. The slightest changes in atmospheric pressure are instantly indicated on the dial and read directly in inches of mercury.

Permanent Magnet Designed to Pick Up Tramp Iron

A complete line of self-contained horizonal and inclined magnetic pulley-type separators each incorporating an Alnico magnetic "Perma-Pulley," idler pulley, endless belt and drive has been announced by Dings Magnetic Separator Co., 4740 W. McGeogh Ave., Milwaukee.

These units are designed to provide completely automatic removal of tramp iron from such materials as coal, ore, chemicals, rock, slag, cement, sand, and clay, where either protection of machinery or purification of product is desired. They are intended for installation at the discharge of chutes, hoppers, and conveyor belts or they can be fed by hand or by various material handling devices.



— *Announcements* —

Joy Manufacturing Co., Pittsburgh, Pa., has announced the acquiring of a minority interest in the **National Mine Service Co.**, Beckley, W. Va.

J. D. A. Morrow, president, and **A. S. Knoizen**, executive vice president, Joy Manufacturing Co., have been elected to the board of directors of the National Mine Service Co.

* * *

Kennametal Inc., of Latrobe, Pa., announces the opening of its own Eastern District office at 6 West Broadway, New York City, for the distribution and servicing of Kennametal cutting tools in eastern New York and northern New Jersey. Standard tools and blanks will be stocked to assure prompt delivery and engineering service will be maintained.

The new office is under the direction of **L. D. Morton** as eastern district manager; **J. G. Brady** will serve as representative.

* * *

H. Merrill Bowman, who has been district sales manager of the **Link-Belt** office in Baltimore, Md., has been appointed assistant divisional sales manager for power transmission equipment, with headquarters at the company's Pershing Road plant in Chicago.

Eugene S. Bogart will succeed Mr. Bowman at Baltimore. Mr. Bogart formerly served the western Pennsylvania and northern West Virginia territories.

* * *

Louis K. von Perbandt, for many years associated with Allen and Garcia Co., is now president of the recently organized **Mines Engineering Co.**, 307 North Michigan Avenue, Chicago. This new company will specialize in the design and construction of mining plants.

* * *

L. F. McCaffrey, special engineer for the metal industries in the industrial sales department, **Allis-Chalmers Manufacturing Co.**, is now located in the company's Pittsburgh district office. Services will be available to assist and coordinate the metal industries group within the Allis-Chalmers district office organization.

* * *

Appointment of the **Monarch Electrical Co.** of LaSalle, Ill., as a distributor of the entire **Hewitt Rubber Division's** line of industrial hose, conveyor and transmission belting, and packing, was announced here by J. H. Hayden, vice president in charge of sales, Hewitt-Robins Inc.

Monarch Electrical Co. is one of Central Illinois' leading supply firms. It serves all local industry within a radius of 75 miles, principally in the communities of Peru, LaSalle, Ottawa, Mendota and Streator.

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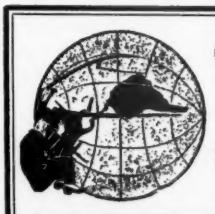

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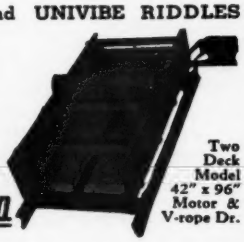

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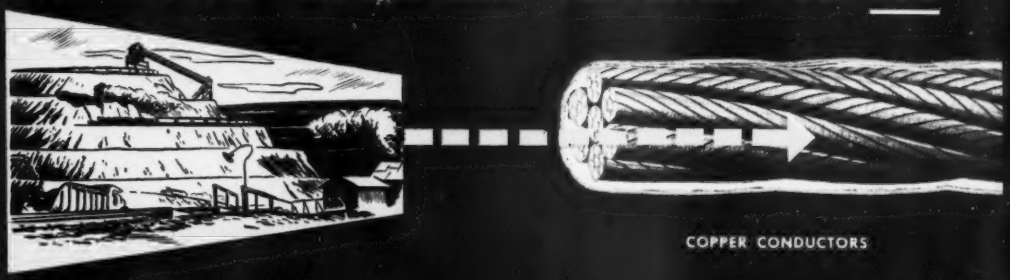

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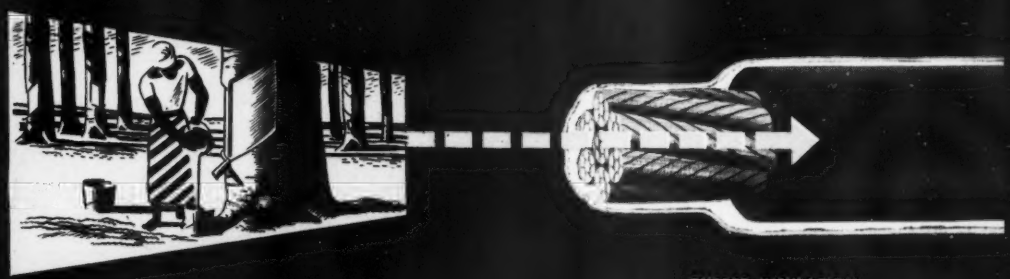

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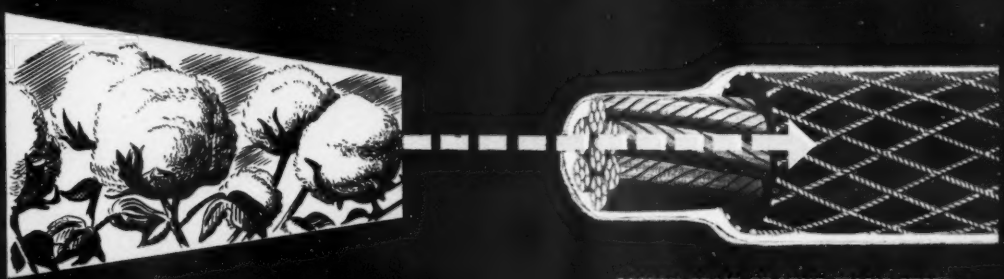

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